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A BOTTOM TRAWL SURVEY FOR CRABS AND GROUNDFISH IN THE SOUTHERN, KAMISHAK BAY, AND BARREN ISLANDS DSTRICTS OF THE COOK INLET MANAGEMENT AREA 16-30 JUNE AND 13-20 AUGUST 1998

by
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ABSTRACT

During 16-30 June and 13-20 August 1998, the Alaska Department of Fish and Game conducted bottom trawl surveys to assess Tanner carb (*Chionoecetes bairdi*), red king crab (*Paralithodes camtschaticus*), and commercially important groundfish in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area. The surveys were conducted with the state research vessel *Pandalus*, overall length 20.1 m (66 ft), making 1-nautical mile tows with a 400-mesh Eastern otter trawl.

The 23 successful tows in the Southern District yielded a population estimate of 658,213 male Tanner crab vulnerable to the trawl survey gear. Legal males comprised only 28% of the population estimate. The Southern District was also estimated to contain 395,499 female Tanner crab, with mature female crab comprising 20% of the surveyed population. The 1998 Southern District survey yielded no red king crab. Seven male and 12 female Dungeness crab were caught. Other species caught during the Southern District survey included weathervane scallop (18 lb), octopus (14 lb), Pacific cod (1,919 lb), walleye pollock (1,542 lb), Pacific halibut (770 lb), rockfish (375 lb), sablefish (57 lb), spiny dogfish (12 lb), and skate (3,522 lb).

The 23 successful tows in the Kamishak and Barren Islands Districts yielded a population estimate of 883,318 male Tanner crab, with legal male crab comprising only 13% of the population vulnerable to the trawl survey gear. The 1998 survey also produced an estimated population abundance of 291,355 female Tanner crab, with mature female crab comprising 3% of the surveyed population. A total of 14 male and 5 female red king crab were caught in the Kamishak and Barren Islands Districts survey. Other species caught during the 1998 survey included weathervane scallops (354 lb), Pacific cod (1,330 lb), walleye pollock (435 lb), Pacific halibut (2,088 lb), rockfish (9 lb), sablefish (32 lb), spiny dogfish (797 lb), and skate (1,428 lb).

The legal segments of both Tanner and red king crabs in the Southern District and the Kamishak and Barren Islands Districts continue to be insufficient to support commercial fisheries. In addition, estimated abundance of prerecruit males, although highly variable over time, remains at a low level with little evidence of stock rebuilding at this time.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) has been conducting bottom trawl surveys for red king (*Paralithodes camtschaticus*) and Tanner (*Chionoecetes bairdi*) crabs in the Cook Inlet Management Area since 1990 (Kimker 1996; Bechtol 2000*b*). Data from these surveys are used to generate crab population estimates, monitor trends in stock abundance, and set quotas for the commercial fisheries (Bechtol and Trowbridge 1999).

The trawl surveys superseded the crab pot surveys that were used by ADF&G prior to 1991 to assess crab stocks (Kimker 1991*a,* 1991*b*). The pot survey data established an index of abundance that was correlated with commercial catch information. The shortcomings of the pot surveys, such as soak variation, dependence on the commercial fishery, and the relative nature of the indices themselves, induced the Department to use a trawl survey to eliminate the influence of these variables and allow direct stock enumeration. Trawl surveys conducted by the National Marine Fisheries Service (NMFS) in the Bering Sea by ADF&G in the Westward Region have historically proven satisfactory in determining stock conditions and fisheries management strategies for king and Tanner crabs.

Many species of groundfish are captured during the trawl surveys. Enumerating the groundfish catch was inconsistent for the first few years of surveys due to personnel limits. Beginning in 1993 the regional groundfish biologist regularly participated in the trawl survey and provided a vehicle for collection and analysis of groundfish data that will be documented in this and other reports.

Objectives

The 1998 survey goals were:

1. Determine the abundance of Tanner and red king crab stocks in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area.

2. Document the size and shell age of all Tanner, king and Dungeness (*Cancer magister*) crabs captured. Determine egg condition of all female crabs.

3. Document the relative catch rates and population biomass of other important invertebrates and key groundfish species including weathervane scallop (*Patinopecten caurinus*), octopus (*Octopus dofleini*), Pacific Cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), sablefish (*Anoplopoma fimbria*), rockfish species (*Sebastes* spp.), spiny dogfish (*Squalus acanthias*), and skate (order *Rajiformes*).

4. Document the abundance, size, sex, maturity, and age of these key groundfish species. These data are will be reported in a separate data report.

METHODS

Study Area and Survey Stations

Survey area selection was based on historical pot indices, commercial catch information, and previous survey catch history. The two general survey areas included (Figure 1): (1) in the Southern District, that portion of Kachemak Bay extending west to 152° W. longitude, and (2) in the Kamishak and Barren Islands Districts, often referred to as Kamishak Bay and including waters of Kamishak Bay extending east to 152° 40' W. longitude.

Initially, Southern District survey stations were 2.5 nautical mile squares (6.25 nmi^2) and Kamishak Bay stations were approximately 5.1 nautical miles squares (26.1 nmi^2; Kimker 1991*a*). However, individual station size and shape varied somewhat due to irregular coastline and depth. Depths shallower than 18 m (10 fathoms) were subsequently precluded from the survey and analysis to reduce potential gear loss problems and to better represent Tanner and king crab habitat. Southern District stations were further delineated into strata deeper and shallower than 92 m (50 fathoms). Individual stations were also re-evaluated with respect to results of previous surveys and commercial fisheries, occasionally resulting in an increase or decrease in the size allocated to a given survey station.

The trawl path was selected within the station grid by the vessel skipper wherever it appeared that a good tow could be made. The initial goal for tow length was 1.0 nautical miles (nmi), which required approximately 30 minutes of towing at 2.5 kts. All tows were made during daylight hours. Because irregular bottom or bottom hang-ups occasionally reduced the duration of a given tow, data analysis was restricted to those tow lengths ≥0.5 nmi. Data from shorter tows were discarded and the tows repeated if time allowed.

Vessel and Gear

The state research vessel *Pandalus*, overall length 20.1 m (66 ft), was used for the survey. A 400-mesh Eastern otter trawl with a 21.3 m (70 ft) headrope and a 29.0 m (95 ft) footrope fished with 363 kg (800 lb), 1.5 m x 2.1 m, Nor'Eastern Astoria V trawl doors. The net opening was estimated to be 2.7 m (9 ft) high and 12.2 m (40 ft) wide. The trawl mesh was 1.6 cm (4 inch) in the wings and body, 1.4 cm (3½ inch) in the intermediate and cod end, and 0.5 cm (1¼ inch) in the cod end liner. Bottom temperature was recorded with a time specific temperature logger attached to the trawl headrope. This temperature logger was typically attached once daily on a tow where the likelihood of gear loss or a bottom hang-up was thought to be minor.

Catch Sampling

Successful tows were brought aboard and weighed. All Tanner, king, and Dungeness crabs were weighed and measured by sex and species. Carapace sizes were measured as widths for Tanner and Dungeness crabs and lengths for king crabs. Shell age was recorded as soft, new, old, or very old for all crab (Table 1; Kimker 1991*a)*. Soft-shell and new-shell crabs are believed to have molted after the most recent winter. In contrast, old shells and very old shells are believed to have been retained for one or more years, thereby having avoided molting for at least one year. Female crabs were also assessed for egg condition and clutch size. All target groundfish, Pacific halibut, and non-crab invertebrates were counted and weighed by species. The remaining catch was either sorted in its entirety or a subsample of 1-3 bushel baskets sorted into species or taxonomic groups. Abundance and aggregate weight was determined for each species or taxonomic group. Pacific Cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), sablefish (*Anoplopoma fimbria*), and rockfish species (*Sebastes* spp.) were further sampled for individual weight, length, sex, maturity, and age. These size, age and maturity data will be described in separate reports (Bechtol 1995, 1998).

Data Analysis

For each district and target species, the population abundance N_i and population biomass B_i were estimated from the following area swept equations:

$$N_i = 151.9 \times \sum_{i=1}^{n} \left(A_i \times \frac{C_i}{l_i} \right)$$

$$B_i = 151.9 \times \sum_{i=1}^{n} \left(A_i \times \frac{C_i}{l_i} \right)$$

where

151.9 = a factor to convert the catch per nautical mile towed to catch per square nautical miles

= 6,076 feet per nautical mile/40 feet (fishing width of the net)

A_i = the surface area of station i in square nautical miles

C_i = the tow catch in area i measures as either number or weight of animals

l_i = the distance towed in area i in nautical mile

Because only survey stations that were sampled with a successful tow were included in the aggregated estimate, these are minimum population estimates. Population numbers were not estimated for king or Dungeness crabs because of the low abundance and patchy distribution of this species.

Crab growth rates often vary by area across the geographic distribution of a given species but tend to be consistent within a given management area. Crab carapace widths were classified into estimated "age" categories based on previous observations of the Cook Inlet crab resources. For

analysis purposes, soft-shell and new-shell crabs were pooled into a single "new" category whereas old-shell and very old-shell crabs were pooled into a single "old" category (Table 1; Kimker 1991*a*). Mean carapace sizes were calculated by weighting size frequency distributions in a survey station by the surface area of the survey station.

RESULTS

Southern District

A total of 23 successful tows, ranging in depth from 15-89 fathoms (28-164 m), were made in the Southern District during 13-20 August 1998 (Figure 2; Appendix A). One tow was repeated after the net ripped on a derelict crab pot. Aggregate catch from all successful tows was 32,330 lb.

After being standardized to catch per nautical mile, target fish and invertebrate species comprised 9,385 lb among all Southern District tows (Table 2). Mean catch among the 23 tows was 408.0 lb/nmi. Target invertebrate catches totaled 1,132 lb of Tanner crab, no king crab, 25 lb of Dungeness crab, 17 lb of weathervane scallop, and 14 lb of octopus. Pacific halibut catches totaled 770 lb and target groundfish species totaled 7,369 lb, comprised of 1,919 lb of Pacific cod, 1,542 lb of walleye pollock, 375 lb of rockfish, 57 lb of sablefish, 3,522 lb of skate, 12 lb of spiny dogfish. Estimated population biomasses within surveyed stations are shown in Appendix C for all species captured in the 1998 Southern District trawl survey.

Tanner Crab

A total, standardized for tow distance, of 987 male Tanner crab was caught in the Southern District (Table 4). Prerecruit-1 and –2 crab comprised a total of 28% of all males caught. Catch of legal male crab (≥140 mm) was only 26% of all size classes combined. New recruits comprised just 16% (163 crab) of the legal male population; 10 postrecruit male (>165 m) were caught. The Southern District population estimate was 658,213 male Tanner crab vulnerable to the trawl survey gear (Tables 5 and 6). Legal males were estimated to total 182,859 Tanner crab, or 28% of the surveyed population (Figures 4 and 5). Carapace widths ranged from 18-193 mm (0.7-7.6 inch; Table 7). Mean male carapace width, weighted by population abundance within stations, was 97.7 mm (3.8 inch); mean width of legal males was 151.8 mm (6.0 inch).

A total, standardized for tow distance, of 634 female Tanner crab was caught in the Southern District survey (Table 8). The Southern District was estimated to contain 395,499 female Tanner crab vulnerable to the trawl survey gear (Tables 9 and 10). Mature females were estimated to total 77,820 Tanner crab, or 20% of the surveyed population. Juvenile crab comprised 82% (n=522) of the catch. Nearly 90% of the total female catch and 43% of the adult females had new shells (Figure 6). Only 13 of the mature females were barren and 61% of the mature females had full clutches. Eggs in all clutches were uneyed. Female carapace width ranged from 20-153 mm (0.8-

6.0 inch; Table 11). Mean carapace width, weighted by population estimates within stations, was 60.8 mm (2.4 inch) and mean width of all mature females was 100.9 mm (4.0 inch).

King Crab

No male or female red king crab were caught in the 1998 Southern District survey (Tables 12, 13, 14, and 15).

Dungeness Crab

Only 7 male Dungeness crab were captured in the 1998 Southern District survey (Table 16 and 17). Male carapace widths ranged from 140-169 mm (5.5-6.9 inch), with a mean width of 160 mm (6.3 inch; Table 7). Three legal-size males were caught, comprising 43% of all male Dungeness captures. All legal males had old shells, two were recruits and one was a postrecruit. Four prerecruit-1 crab were caught; two had old shells and two had new shells.

The Southern District survey caught 12 female Dungeness crab (Tables 18 and 19). Fifty percent of the female crab has new shells. Based on the observed carapace widths, all female Dungeness were assumed to be mature, although all were barren. Carapace widths ranged from 113-153 mm (4.4-6.0 inch), with a weighted mean of 132.6 mm (5.2 inch; Table 11).

Weathervane Scallop

A total of 57 weathervane scallops, with an aggregate weight of 18 lb, were caught among seven tows in the Southern District survey (Table 2; Figure 2). The largest catches occurred at stations 4 (7 lb) and 7 (4 lb). Shell heights of 12 sampled scallops ranged from 80-165 mm (3.1-6.5 inch) and mean height was 124.3 mm (4.9 inch; Figure 7). The population estimate for weathervane scallops in the surveyed stations was 11,069 lb (Appendix C).

Groundfish and Halibut

Pacific halibut were caught in 78% of the Southern District tows; mean halibut catch was 33.5 lb/nmi (Table 2). Catch biomass of Pacific halibut was greatest in stations 2 (118 lb/nmi) and 22 (111 lb/nmi; Figure 2). Estimated population biomass was 566,948 lb of Pacific halibut in the surveyed area. Pacific cod were caught in all stations. Catches of Pacific cod ranged from 1-785 lb/nmi, with a mean catch rate of 83.4 lb/nmi. The largest catch rates occurred in stations 22 (785 lb/nmi), 16 (611 lb/nmi), and 21 (136 lb/nmi) along the outer portion of the survey area (Figure 2). Estimated population biomass was 1.5 million lb of Pacific cod in the surveyed area. Walleye pollock were caught in 17 (74%) of the surveyed stations. Pollock catch totaled 1,542 lb among all tows, with a mean catch rate of 67.0 lb/nmi. Catch rates ranged from none to over 200 lb/nmi with the greatest catch rate of 258 lb/nmi from station 13 (Figure 2). In general, the greatest catches occurred from the Homer Spit to Seldovia Point with few pollock caught in the outermost stations of the district. Estimated population biomass was 1.3 million lb of walleye

pollock in the surveyed area. Standardized rockfish catches totaled 375 lb, comprised of 340 lb of dusky, 32 lb of rougheye, 3 lb of redbanded, and <1 lb of redstripe rockfishes (Table 2). Mean rockfish catch was 16.3 lb/nmi, with catch rates ranging from 0-167 lb/nmi. Sablefish were caught in 43% of the survey stations (n=10 stations), and catches totaled 57 lb/nmi. Maximum sablefish catch was 14 lb/nmi from station 12. Skates were caught in 91% (n=21 stations) of the survey tows and produced the largest catches of all target species in the Southern District survey (Table 2). Skate catches averaged 153.1 lb/nmi among tows, with station 71 producing the largest catch of 969 lb/nmi. Standardized spiny dogfish catches totaled 12 lb/nmi, based on a single fish caught in station 71.

Kamishak and Barren Islands Districts

A total of 23 successful tows were made in the Kamishak and Barren Islands Districts during 16-30 June 1998 (Appendix B; Table 3; Figure 3). Aggregate catch from all tows was 22,729 lb; total catch of all non-target species and debris was 15,915 lb. After being standardized to catch per nautical mile, target species comprised 6,814 lb among all tows (Table 3). Mean catch among the 23 tows was 296.3 lb/nmi. Target invertebrate catches totaled 221 lb of Tanner crab, 120 lb of king crab, 354 lb of weathervane scallop, and no Dungeness crab. Pacific halibut catches totaled 2,088 lb and target groundfish species totaled 4,030 lb, comprised of 1,330 lb of Pacific cod, 435 lb of walleye pollock, 32 lb of sablefish, 9 lb of rockfish, 1,428 lb of skate, and 797 lb of spiny dogfish. Estimated population biomasses within surveyed stations are shown in Appendix D for all species captured in the 1998 trawl survey of the Kamishak and Barren Islands Districts.

Tanner Crab

A total, standardized for tow distance, of 229 male Tanner crab was caught in the Kamishak and Barren Islands Districts (Table 20). Prerecruit-1 and -2 crabs comprised a total of 47% (n=106) of all males caught. Catch of legal male crab (≥140 mm) was only 13% of all age classes combined. New recruits comprised just 4% (n=8) of the legal male catch; no postrecruit males were caught. The population estimate for the Kamishak and Barren Islands Districts was 883,318 male Tanner crab vulnerable to the trawl survey gear (Tables 6 and 21; Figures 8 and 9). Estimated population abundance of legal males was 117,963 Tanner crab, or 13% of the surveyed male population. Carapace widths ranged from 17-163 mm (0.7-6.4 inch; Table 7). Mean male carapace width, weighted by population abundance within stations, was 96.3 mm (3.8 inch); mean width of legal males was 146.6 mm (5.8 inch).

A total of 77 female Tanner crab was caught in the Kamishak and Barrens Islands Districts survey (Table 22). Juveniles comprised 97% (n=75) of the catch (Figure 6). One of the mature females had a new shell and none of the mature females were barren. Female carapace width ranged from 28-98 mm (1.1-3.9 inch; Table 11). Mean carapace width, weighted by station area, was 46.3 mm (1.8 inch). Estimated population abundance for the districts was 291,355 female Tanner crab vulnerable by the trawl survey gear (Tables 9 and 23). Mature females comprised 3% of the surveyed population, or 7,935 crab.

King Crab

The 1998 survey of the Kamishak and Barren Islands Districts yielded a total of 14 male red king crab from seven stations (Tables 12 and 13). Twelve males (86% of the total) were of legal size (≥145 mm; 5.7 inch), 11 new-shell recruits and one new-shell postrecruit. The remaining two king crab catch were new shell prerecruit-1 crab. Carapace lengths (Table 7) among all samples ranged from 136-167 mm (5.4-6.6 inch) with a mean size of 152.1 mm (6.0 inch).

After catch rate standardization for tow length, the 1998 survey caught 5 female red king crab in the Kamishak and Barren Islands Districts, all from station 46 (Tables 14 and 15). Three females had new shells and two females had old shells. All females were mature; one female had a full clutch and the remainder had partial clutches. Carapace lengths of female king crab ranged 122-133 mm (4.8-5.2 inch; Table 11) and mean length was 126.2 mm (5.0 inch).

Weathervane Scallop

A total of 378 weathervane scallops, with a weight of 354 lb, was caught among eight tows in the Kamishak and Barren Islands Districts survey. The largest component of the catch biomass occurred at station 44 (272 lb) east of Augustine Island (Figure 3).

Groundfish and Halibut

Pacific halibut were caught in all except three tows in the Kamishak and Barren Islands Districts; mean halibut catch among all tows was 90.8 lb/nmi (Table 3). Catch biomass of halibut was greatest in station 61 (Figure 3), which yielded a catch rate of 254 lb/nmi. Estimated population biomass was 8.1 million lb of Pacific halibut in the surveyed area.

Pacific cod were caught in 19 stations (83% frequency of occurrence) and yielded the third greatest catch among all target species caught in the 1998 survey. Catch of Pacific cod totaled 1,330 lb among all stations, with a mean catch rate of 57.8 lb/nmi among tows. The largest catch rates occurred in stations 33 (304 lb/nmi) and 50 (214 lb/nmi) (Figure 3). Estimated population biomass was 5.2 million lb of Pacific cod in the surveyed area. Walleye pollock were caught in 13 (57%) of the surveyed stations. Pollock catch totaled 435 lb among all tows, with a mean catch rate of 18.9 lb/nmi. The greatest catch rate was 108 lb/nmi from station 34 (Figure 3). Estimated population biomass was 1.7 million lb of walleye pollock in the surveyed area. Standardized rockfish catches totaled 9 lb, comprised of 1 lb of dusky (n=3) and 8 lb of rougheye (n=4) rockfishes (Table 2). Mean rockfish catch was 0.4 lb/nmi. Sablefish were caught in 30% of the survey stations (n=7 stations), and catches totaled 32 lb/nmi. The largest sablefish catch was 14 lb/nmi from station 60. Skates were caught in 78% (n=18 stations) of the survey tows and produced the second largest total catch (1,428 lb) of all target species in the Kamishak and Barren Islands Districts survey (Table 3). Skate catches averaged 62.1 lb/nmi among tows, with station 45 producing the largest catch of 324 lb/nmi. Estimated population biomass was 6.1

million lb of skates within the surveyed area. Spinyt dogfish were caught in 96% (n=22 stations) of the survey tows. Catches totaled 797 lb with a mean catch rate of 34.7 lb/nmi and a maximum catch rate of 114 lb/nmi at station 45. Estimated population biomass was 3.0 million lb in the surveyed area.

Bottom Temperature

Benthic water temperature along the ocean floor was sampled with the temperature logger at two stations in the Southern District in 1998. The temperature was 9.3°C at a mean depth of 66 fathoms during the tow of station 9 on 14 August 1998 and 9.6°C at a mean depth of 17 fathoms during the tow of station 5 on 17 August 1998 (Figure 2; Appendix E). In the Kamishak and Barren Islands Districts, benthic water temperature was recorded at five stations over the course of several weeks. During 16-17 June 1998, benthic temperature was 5.7°C at 81 fathoms in station 61 and 6.8°C at 76 fathoms in station 60. During 28-30 June 1998, benthic temperature ranged from 8.1-9.5°C at depths of 17-29 fathoms in stations 33, 41, and 44.

DISCUSSION

Tanner Crab

The legal segment of Tanner crab in both the Southern District and the Kamishak and Barren Islands Districts continued to be insufficient to support a commercial fishery. Limited commercial fisheries occurred most recently in the Southern District from 1991 through 1994 (Kimker 1996; Bechtol and Trowbridge 1999). Trawl surveys in this district documented a decline in the Tanner crab stock from >2.5 million males in the early 1990s to <0.9 million in 1994. Following an increase to 1.9 million males in 1995, male crab abundance steadily decreased to a record low of 0.7 million male crab in 1998 (Table 6; Bechtol 1998; Bechtol and Trowbridge 1999). Estimated abundance of legal males increased from 1996 to 1998, but remined substantially below even the harvest abundance from the late 1960s to the late 1980s (Figure 11). This trend was most apparent for postrecruit Tanner crab, which comprised only 1% of the male Tanner crab catch in the 1998 Southern District survey. Although the increase in legal males is promising, the estimated abundance of prerecruit males, although highly variable over time, has generally declined since the early 1990s and provides little evidence of stock rebuilding.

In the Kamishak and Barren Islands Districts, the commercial Tanner crab fisheries remained closed following the 1991 season (Kimker 1996; Bechtol and Trowbridge 1999). Estimated abundance of both total males and legal males continued to decline for the second consecutive year (Table 6). The total male catch was the lowest in the trawl survey history, largely due to a continued decline in prerecruit crab abundance. Although the existence of a terminal molt in Tanner crab continues to be debated (Paul and Paul 1990; Bechtol 2000*b*), it is apparent that old shell crab have been a

significant component of the Cook Inlet population, especially in the Kamishak and Barren Islands Districts.

Trawl survey selectivity increases with cohort age due to factors including trawl mesh size and the size- and sex-specific habitat distributions of the crab cohorts. Estimated abundance of prerecruit-4 male crab remains particularly suspect because prerecruit-4 abundance should exceed the subsequent prerecruit-3 abundance in order to accommodate natural mortality (Table 6; Figures 5 and 9). Nonetheless, the trawl survey uses a consistent gear fished in a standard manner that should effectively detect changes in the abundance of particular cohorts, as well as the entire population, over time. Thus, there is little evidence of stock rebuilding at this time (Figure 11).

Another indicator of stock status is the percentage of mature and egg-bearing females, although this percentage has been somewhat variable over time (Table 10). The percentage of mature females was a record low in all surveys districts. In 1998 the percentage of mature females bearing eggs remained high in all survey areas (Tables 8 and 22). In all areas, estimated abundance of juvenile crab was greater than in the 1997 survey. However, estimated abundance of both mature and juvenile female crabs in 1998 was at the lowest in the history of the trawl survey in the Southern District and the second lowest in the history of the Kamishak and Barren Islands Districts.

Historical pot and trawl survey data exhibit a positive bias toward male Tanner crab (Tables 6 and 10; Kimker 1996). This bias likely resulted from two factors: (1) an emphasis on stations that historically yielded the best catches of male Tanner crab in previous surveys and commercial fisheries; and (2) when bad weather caused a loss in survey fishing time, stations that have not shown significant male catches are eliminated from the survey. In addition, Tanner crab exhibit annual migration patterns, particularly given annual variations in water temperatures. Although some consistency in crab distribution can be expected, waters temperatures may affect those distributions and, thus, trawl survey catches.

King Crab

Compared to historical commercial catch data, which only summarized harvests of legal males, survey results in 1998 indicated the overall population level of red king crab remains severely depressed in both the Southern, Kamishak, and Barren Islands Districts (Table 13; Bechtol 1998). For example, the mean commercial catch prior to the final 1984 closure was 3.4 million lb (Bechtol and Trowbridge 1999). Assuming an average weight of 6.5 lb per crab, the 1984 catch represented 0.5 million legal males. In contrast, king crab catches during the 1998 trawl survey were considered too low to generate a meaningful estimate of population abundance. Although some individuals may argue that a bottom trawl survey is not an effective tool to sample king crab in the Southern District, this data has provided a meaningful index of population status (Bechtol and Trowbridge 1999). Thus, the lack of any king crab catch in this district in 1998 is particularly disconcerting (Tables 13 and 15). The 14 male king crab and 5 female king crab caught in the Kamishak and Barren Islands Districts in 1998 represented substantial reductions from 1997 survey catches. This may indicate the 1997 survey may have encountered a localized aggregation. It can be expected that given the overall low abundance of king crab in this area, localized aggregations may

periodically be encountered but will not represent a significant rebuilding of the red king crab population.

Dungeness Crab

The Southern District trawl surveys recognized a group of Dungeness males as they moved through the successive years beginning in 1990 (Table 17; Bechtol 2000*b*). Trawl data indicated a large reduction of these males by 1994. The presence of a strong cohort was also observed in the 1995 and 1996 trawl surveys, as the catch of both total males and legal males increased. However, the catch of both male and female Dungeness has continued to decline since 1996, and the 1998 trawl survey catch was the lowest on record for both sexes (Tables 17 and 19). Although the trawl survey was not designed specifically to assess the Dungeness crab stock and provides only a relative index of abundance, trends in the trawl survey data generally agree with the results of the Southern District Dungeness pot survey (Trowbridge et al. 2000). Based on results of all surveys, the Dungeness crab resource in the Southern District continues to remain depressed with insufficient levels of abundance to support a commercial fishery.

Weathervane Scallop

The bottom trawl survey has typically caught weathervane scallops at a variety of locations throughout the Cook Inlet Management Area (Tables 2 and 3). In the Kamishak Bay area, trawl survey data, in conjunction with commercial fishery harvest reports, was used to identify preliminary survey stations for an ADF&G dredge survey for weathervane scallops (Bechtol 2000*a*). Although not likely to become the primary assessment tool, trawls survey data may provide utility to "tune" an age-structured model for weathervane scallops in Kamishak Bay.

Groundfish and Halibut

Catches of groundfish and halibut have been inconsistently recorded from the historical trawl surveys of the Cook Inlet Management Area. However, it is apparent that Pacific cod, walleye pollock, and Pacific halibut are the predominant vertebrate species caught in the trawl survey (Tables 2 and 3). A more comprehensive review of historical field data forms may reveal additional quantitative information that can be used to document trends in abundance and biomass for some species. Beginning with the 1998 survey, trawl survey sampling methods were modified to subsample the entire trawl catch instead of sampling only target species. In addition to providing a broader assessment of ecosystem health, increased subsampling provides data to monitor changes in a greater variety of species, including some species for which future fisheries may develop.

Survey Design

The trawl survey methodology was modified somewhat in 1998 to include a more comprehensive approach to sampling the catch approach. First, the defined target species was expanded slightly to include skates and sharks. Second, after removal of vertebrate and invertebrate target species, the remaining catch was either sampled in its entirety or subsampled. This approach will provide a more standardized method of documenting long-term changes in the Cook Inlet ecosystem.

Based on preliminary results (Appendices C and D), it is apparent that a variety of flounder and sole comprised the largest catch biomass in the Cook Inlet trawl surveys. In particular, butter sole was yielded the highest mean catch rate (291.0 lb/nmi) among all species in the Southern District despite being caught in only 43% of survey stows. In the Kamishak and Barren Islands Districts, the mean catch rate of butter sole (236.9 lb/nmi) was second only to arrowtooth flounder (333.5 lb/nmi).

The bottom trawl survey and its predecessor, the pot survey, were intended to assess commercially important crab resources in the Cook Inlet Management Area. As a result, these surveys have focused on the habitat where Tanner and red king crabs have been historically found. To avoid overestimating the population, area-swept estimates have only been extrapolated to those survey stations that were actually sampled in the annual survey. This likely introduced some bias to the population estimates because the actual stations surveyed, and the total number of stations surveyed, has changed slightly each year. Given the low level of crab abundance during the last decade, this bias has not affected the management approach. However, with a greater emphasis upon providing a multi-species approach to the bottom trawl survey data, the survey design may be improved in the future by developing a more standardized approach to estimating the total survey area.

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Table 1. Carapace widths (mm) used to determine crab size classes in Cook Inlet.

Class	Prerecruit				Recruit	Postrecruit
	Pre-4	Pre-3	Pre-2	Pre-1		
	Tanner Crab					
Width	<70	70-91	92-114	115-139	140-165	>165
	King Crab					
Width	<91	92-108	109-126	127-144	145-163	>163
	Dungeness Crab					
Width	<89	90-114	115-139	140-164	165-189	>189

Table 2. Catch biomass of target species per nautical mile tow in a bottom trawl survey of the Southern District, Cook Inlet, 1998.

	Round Weight (lb/nmi)												
Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Octopus	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Pacific Halibut	Spiny Dogfish	Skate	Total
1	5	35	0	1	0	32	48	0	0	53	0	158	332
2	8	42	0	<1	0	40	50	0	0	118	0	98	356
3	5	1	0	3	0	10	20	<1	0	0	0	142	180
4	1	7	0	7	0	7	26	0	0	54	0	287	389
5	0	0	0	0	0	21	2	1	0	7	0	127	158
6	0	9	0	0	0	9	35	0	0	0	0	372	424
7	2	7	0	4	0	6	24	0	3	42	0	265	354
8	0	224	0	0	0	44	8	6	12	74	0	24	392
9	0	210	0	0	0	16	255	11	0	0	0	126	618
10	0	16	0	0	0	10	208	6	8	18	0	4	269
11	0	370	0	<1	0	47	133	24	2	18	0	39	634
12	0	24	0	2	0	2	158	4	14	8	0	60	272
13	0	94	0	0	14	28	258	16	0	6	0	193	609
14	0	0	0	0	0	1	102	8	0	0	0	192	303
15	0	92	0	0	0	12	180	0	1	8	0	198	491
16	0	0	0	0	0	611	0	167	0	76	0	0	855
17	0	0	0	0	0	2	0	5	12	32	0	39	90
18	0	0	0	0	0	18	0	7	2	18	0	0	46
19	0	0	0	0	0	36	0	22	2	70	0	64	194
20	1	0	0	0	0	2	0	0	0	40	0	80	123
21	0	0	0	0	0	136	0	98	1	16	0	24	274
22	0	0	0	0	0	785	2	0	0	111	0	60	958
71	3	0	0	0	0	46	34	0	0	0	12	969	1,064
Total	25	1,132	0	18	14	1,919	1,542	375	57	770	12	3,522	9,385
Mean	1.1	49.2	0.0	0.8	4%	83.4	67.0	16.3	2.5	33.5	0.5	153.1	408.0
Freq.	30%	57%	0%	30%	0.6	100%	74%	61%	43%	78%	4%	91%	100%

Table 3. Catch biomass of target species per nautical mile tow in a bottom trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1998.

	Round Weight (lb/nmi)												
Survey Station	Dungeness Crab	Tanner Crab	King Crab	Weathervane Scallop	Octopus	Pacific Cod	Walleye Pollock	Rockfish	Sablefish	Pacific Halibut	Spiny Dogfish	Skate	Total
30	0	0	0	0	0	28	64	0	0	0	18	48	158
32	0	65	14	18	0	72	38	0	0	48	0	4	259
33	0	7	0	4	0	304	20	0	0	61	22	30	448
34	0	0	6	0	0	6	108	0	0	102	42	0	264
37	0	4	24	46	0	74	2	0	1	102	34	0	287
38	0	0	8	0	0	0	0	0	0	47	24	0	79
41	0	2	0	0	0	20	2	0	0	96	56	0	176
44	0	2	24	272	0	14	0	0	0	174	48	14	548
45	0	0	22	0	0	0	0	0	0	232	114	324	692
46	0	0	22	0	0	0	0	0	0	0	6	0	28
47	0	13	0	0	0	42	89	0	1	22	66	42	274
48	0	6	0	0	0	92	4	0	2	67	24	52	247
50	0	2	0	4	0	214	0	1	0	156	50	70	497
51	0	12	0	6	0	0	0	0	0	122	12	22	174
52	0	0	0	4	0	0	0	0	0	188	62	4	258
53	0	35	0	0	0	18	60	0	0	74	14	28	229
56	0	0	0	1	0	34	0	0	4	120	46	44	249
57	0	2	0	0	0	158	0	0	0	28	6	120	314
58	0	16	0	0	0	122	6	0	0	98	28	54	324
60	0	1	0	0	0	28	2	0	14	64	18	68	195
61	0	0	0	0	0	18	0	0	0	254	7	186	464
67	0	11	0	0	0	84	18	0	8	34	54	206	415
68	0	45	0	0	0	2	22	8	2	0	46	112	237
Total	0	221	120	354	0	1,330	435	9	32	2,088	797	1,428	6,814
Mean	0.0	9.6	5.2	15.4	0.0	57.8	18.9	0.4	1.4	90.8	34.7	62.1	296.3
Freq.	0%	74%	30%	35%	0%	83%	57%	9%	30%	87%	96%	78%	100%

Table 4. Catch of male Tanner crab by shell age and size per nautical mile towed during a trawl survey of the Southern District, Cook Inlet, 1998.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	32	2	4	3	8	3	2	1	0	0	3	54
2	140	6	0	0	0	0	0	1	0	0	1	147
3	0	0	0	0	0	0	0	0	0	0	0	0
4	59	1	0	0	0	0	0	0	0	0	0	60
5	60	0	0	0	0	0	0	0	0	0	0	60
6	21	2	0	0	0	1	0	0	0	0	0	24
7	68	2	1	1	1	0	0	0	0	0	0	73
8	3	1	5	0	66	0	49	0	0	0	49	124
9	5	1	1	3	36	21	27	8	0	0	35	102
10	6	2	1	3	4	1	3	0	1	0	4	21
11	8	7	4	1	23	45	25	68	5	0	98	186
12	2	0	0	2	4	2	0	1	2	0	3	13
13	23	0	1	0	15	0	39	0	0	0	39	78
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	1	5	11	18	7	2	0	27	44
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
					Southern District Total							
Total	427	25	17	14	162	85	163	86	10	0	259	987
Percent	43%	2%	2%	1%	16%	9%	16%	9%	1%	0%	26%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 5. Population estimate by shell age and size for male Tanner crab in the Southern District, Cook Inlet, 1998.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	23,967	1,498	2,996	2,247	5,992	2,247	1,498	749	0	0	2,247	41,193
2	62,097	2,661	0	0	0	0	0	444	0	0	444	65,202
3	0	0	0	0	0	0	0	0	0	0	0	0
4	27,461	509	0	0	0	0	0	0	0	0	0	27,969
5	54,513	0	0	0	0	0	0	0	0	0	0	54,513
6	15,685	1,651	0	0	0	826	0	0	0	0	0	18,162
7	40,594	1,194	597	597	597	0	0	0	0	0	0	43,579
8	1,627	542	2,711	0	35,791	0	26,572	0	0	0	26,572	67,243
9	3,486	697	697	2,092	25,100	14,642	18,825	5,578	0	0	24,403	71,117
10	7,765	2,588	1,294	3,883	5,177	1,294	3,883	0	1,294	0	5,177	27,178
11	5,754	5,115	2,557	639	15,984	31,968	17,263	47,952	3,836	0	69,051	131,069
12	1,899	0	0	1,899	3,798	1,899	0	949	1,899	0	2,848	12,342
13	21,836	0	949	0	14,241	0	37,026	0	0	0	37,026	74,051
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	559	2,795	6,149	10,062	3,913	1,118	0	15,093	24,596
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
					Southern District Total							
Total	266,684	16,456	11,802	11,915	109,473	59,024	115,128	59,585	8,147	0	182,859	658,213
Percent	41%	3%	2%	2%	17%	9%	17%	9%	1%	0%	28%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 6. Historical population estimates by carapace length and age for male Tanner crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1998.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	453,024	682,569	541,891	9,492	403,015	37,055	137,235	163,961	12,081	53,504	366,781	2,493,827
1991	316,529	295,026	826,589	35,265	790,463	117,838	279,543	187,509	45,587	24,084	536,723	2,918,433
1992	306,159	134,137	438,453	34,688	683,607	205,970	740,136	138,101	49,547	26,155	953,939	2,756,953
1993	599,873	89,299	120,343	12,548	215,292	109,962	280,719	185,496	41,158	16,946	524,319	1,671,636
1994	258,118	169,986	114,102	8,572	95,260	58,967	65,675	94,138	6,726	20,633	187,172	892,177
1995	372,035	356,327	449,225	17,330	386,004	37,399	157,383	62,421	6,049	9,466	235,319	1,853,639
1996	189,773	42,712	312,708	121,332	368,250	156,423	48,546	45,116	0	0	93,662	1,284,860
1997	148,607	111,729	267,005	6,655	311,678	36,110	143,170	10,525	0	0	153,695	1,035,478
1998	266,684	16,456	11,802	11,915	109,473	59,024	115,128	59,585	8,147	0	182,859	658,213

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1,831,889	332,005	535,114	429,654	257,792	2,085,775	105,461	488,244	0	0	593,705	6,065,934
1991	230,638	155,084	286,310	91,460	357,887	1,053,779	39,765	330,052	0	0	369,817	2,544,975
1992	251,834	552,348	360,846	233,671	166,434	1,236,465	19,629	193,576	0	3,968	217,173	3,018,771
1993	298,382	151,385	523,487	211,521	137,821	530,615	23,387	87,287	0	0	110,674	1,963,885
1994	200,254	852,801	1,168,971	431,525	916,511	673,005	51,582	126,964	0	3,968	182,514	4,425,581
1995	47,256	422,861	841,368	502,175	733,399	875,308	171,912	71,418	0	0	243,330	3,665,697
1996	681,961	162,180	297,593	366,916	730,491	1,561,542	88,162	315,768	0	3,967	407,897	4,208,580
1997	519,036	23,800	15,594	342,027	202,073	1,388,968	107,126	282,795	0	7,935	397,856	2,889,354
1998	318,593	34,109	0	66,769	31,689	314,195	31,741	86,221	0	0	117,963	883,318

Carapace widths (mm) used for Tanner crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	71-90	91-114	115-139	140-165	>165

Table 7. Maximum, minimum, and mean carapace width (mm) of male Tanner and Dungeness crabs and carapace length (mm) of male king crab caught in trawl surveys of Cook Inlet, 1998.

Southern District							Kamishak and Barren Islands Districts						
	Tanner Crab			Dungeness Crab				Tanner Crab			King Crab		
Station	Min.	Max.	Mean	Min.	Max.	Mean	Station	Min.	Max.	Mean	Min.	Max.	Mean
1	23	159	93.8	140	166	153.0	30						
2	24	140	57.9	162	166	164.0	32	41	147	109.9	136	159	147.5
3				157	157	157.0	33	30	151	75.3			
4	29	86	46.6				34				142	142	142.0
5	32	64	46.4				37	123	150	134.3	141	162	153.3
6	26	123	55.8				38				161	161	161.0
7	30	133	56.1	169	169	169.0	41	126	126	126.0			
8	58	164	130.6				44	98	127	112.5	146	167	157.3
9	33	160	128.1				45				143	159	153.3
10	32	180	106.7				46				139	139	139.0
11	24	193	120.7				47	41	136	96.4			
12	28	171	117.7				48	111	135	126.2			
13	18	162	105.4				50	146	146	146.0			
14							51	122	162	138.1			
15	103	168	141.6				52						
16							53	22	163	117.0			
17							56	30	45	37.5			
18							57	120	125	122.5			
19							58	30	152	75.0			
20							60	33	81	57.0			
21							61	17	24	20.5			
22							67	31	139	62.8			
71				160	160	160.0	68	30	156	103.5			
Total	19	193	97.7	140	169	160.0		17	163	96.5	136	167	152.1

Table 8. Catch per nautical mile towed of female Tanner crab by carapace age and clutch fullness in a trawl survey of the Southern District, Cook Inlet, 1998.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	45	0	0	0	0	0	0	0	1	1	0	1	1	47
2	177	0	0	0	0	0	0	6	0	0	6	0	0	183
3	7	0	0	0	0	0	0	0	1	0	0	1	0	8
4	73	0	0	0	0	0	0	0	0	0	0	0	0	73
5	52	0	0	0	0	0	0	0	0	0	0	0	0	52
6	30	0	0	0	0	0	0	0	0	0	0	0	0	30
7	85	0	0	0	0	0	0	0	0	1	0	0	1	86
8	13	0	0	1	0	0	0	0	0	1	0	0	2	15
9	9	18	15	32	21	0	6	0	0	0	39	15	38	101
10	11	0	0	0	1	0	0	0	0	0	1	0	0	12
11	5	1	0	0	1	0	0	0	0	0	2	0	0	6
12	1	0	0	1	0	0	2	0	0	0	0	0	3	4
13	13	0	0	0	0	0	0	0	0	0	0	0	0	13
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	1	0	0	1	1
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	1	0	0	0	0	0	0	0	0	1	0	0	1	2
						Southern District Total								
Abund.	522	19	15	34	23	0	8	6	2	5	48	17	47	634
Percent	82%	3%	2%	5%	4%	0%	1%	1%	0%	1%	8%	3%	7%	100%

Table 9. Population estimate by carapace condition and clutch fullness for female Tanner crab in the Southern District, Cook Inlet, 1998.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	33,704	0	0	0	0	0	0	0	749	749	0	749	749	35,202
2	78,508	0	0	0	0	0	0	2,661	0	0	2,661	0	0	81,169
3	5,869	0	0	0	0	0	0	0	838	0	0	838	0	6,708
4	34,072	0	0	0	0	0	0	0	0	0	0	0	0	34,072
5	46,994	0	0	0	0	0	0	0	0	0	0	0	0	46,994
6	23,115	0	0	0	0	0	0	0	0	0	0	0	0	23,115
7	50,742	0	0	0	0	0	0	0	0	597	0	0	597	51,339
8	7,050	0	0	542	0	0	0	0	0	542	0	0	1,085	8,134
9	6,275	12,550	10,458	22,311	14,642	0	4,183	0	0	0	27,192	10,458	26,494	70,419
10	14,236	0	0	0	1,294	0	0	0	0	0	1,294	0	0	15,530
11	3,197	639	0	0	639	0	0	0	0	0	1,279	0	0	4,476
12	949	0	0	949	0	0	1,899	0	0	0	0	0	2,848	3,798
13	12,342	0	0	0	0	0	0	0	0	0	0	0	0	12,342
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	949	0	0	949	949
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	626	0	0	0	0	0	0	0	0	626	0	0	626	1,252
						Southern District Total								
Abund.	317,679	13,189	10,458	23,803	16,575	0	6,082	2,661	1,587	3,463	32,426	12,046	33,348	395,499
Percent	80%	3%	3%	6%	4%	0%	2%	1%	0%	1%	8%	3%	8%	100%

Table 10. Historical population estimates for female Tanner crab caught in Cook Inlet bottom trawl surveys, 1990-1998.

Southern District

Year	Juvenile	Mature	Total	% Mature
	Estimated Abundance			
1990	919,907	393,506	1,313,413	30.0%
1991	519,521	914,322	1,433,843	63.8%
1992	350,782	533,748	884,530	60.3%
1993	573,958	600,634	1,174,592	51.1%
1994	515,136	373,041	888,177	42.0%
1995	609,577	676,352	1,285,929	52.6%
1996	223,189	451,068	674,257	66.9%
1997	162,867	209,994	372,861	56.3%
1998	317,679	77,820	395,499	19.7%
			Average	49.2%

Kamishak and Barren Islands Districts

Year	Juvenile	Mature	Total	% Mature
	Estimated Abundance			
1990	2,140,458	499,961	2,640,419	18.9%
1991	326,075	87,484	413,559	21.2%
1992	453,343	217,801	671,144	32.5%
1993	389,426	826,705	1,216,131	68.0%
1994	490,030	944,491	1,434,521	65.8%
1995	195,451	479,970	675,421	71.1%
1996	637,737	150,670	788,407	19.1%
1997	227,905	79,352	307,257	25.8%
1998	283,420	7,935	291,355	2.7%
			Average	36.1%

Table 11. Maximum, minimum, and mean carapace width of female Tanner, king, and Dungeness crabs caught in trawl surveys of Cook Inlet, 1998.

Southern District							Kamishak and Barren Islands Districts						
	Tanner Crab			Dungeness Crab				Tanner Crab			King Crab		
Station	Min.	Max.	Mean	Min.	Max.	Mean	Station	Min.	Max.	Mean	Min.	Max.	Mean
1	32	84	59.2	134	143	138.5	30						
2	46	83	60.8	113	147	128.0	32	43	57	50.3			
3	33	71	49.1	136	136	136.0	33	33	67	49.1			
4	22	75	43.8				34						
5	32	64	46.7				37						
6	21	82	56.1				38						
7	24	80	49.1	120	120	120.0	41						
8	35	97	69.8				44						
9	34	113	94.1				45						
10	33	87	55.0				46				122	133	126.2
11	33	88	56.1				47	39	81	57.0			
12	28	116	88.8				48						
13	24	74	42.7				50						
14							51						
15							52						
16							53	48	98	72.0			
17							56	64	64	64.0			
18							57						
19							58	28	78	49.0			
20				153	153	153.0	60	58	58	58.0			
21							61	28	28	28.0			
22							67	34	49	39.7			
71	20	20	20.0	137	137	137.0	68	29	42	35.3			
Total	20	116	60.8	113	153	134.6		28	98	46.3	122	133	126.2

Table 12. Station catch per nautical mile by carapace length and age of male king crab caught in trawl surveys of the Cook Inlet Management Area, 1998.

Southern District

Station[a]	Pre-4	Pre-3	Sublegal Males: Pre-2 (new)	Sublegal Males: Pre-2 (old)	Sublegal Males: Pre-1 (new)	Sublegal Males: Pre-1 (old)	Legal Males: Recruit (new)	Legal Males: Recruit (old)	Legal Males: Postrecruit (new)	Legal Males: Postrecruit (old)	Total legal	Total males
No Catch												

Kamishak and Barren Islands Districts

Station[a]	Pre-4	Pre-3	Sublegal Males: Pre-2 (new)	Sublegal Males: Pre-2 (old)	Sublegal Males: Pre-1 (new)	Sublegal Males: Pre-1 (old)	Legal Males: Recruit (new)	Legal Males: Recruit (old)	Legal Males: Postrecruit (new)	Legal Males: Postrecruit (old)	Total legal	Total males
32	0	0	0	0	1	0	1	0	0	0	1	2
34	0	0	0	0	0	0	1	0	0	0	1	1
37	0	0	0	0	0	0	3	0	0	0	3	3
38	0	0	0	0	0	0	1	0	0	0	1	1
44	0	0	0	0	0	0	2	0	1	0	3	3
45	0	0	0	0	0	0	3	0	0	0	3	3
46	0	0	0	0	1	0	0	0	0	0	0	1
Kamishak and Barren District Total												
Abund.	0	0	0	0	2	0	11	0	1	0	12	14
Percent	0%	0%	0%	0%	14%	0%	79%	0%	7%	0%	86%	100%

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

[a] - Stations not listed had no catch of male king crab.

Table 13. Historical catch per nautical mile by carapace length and age for male king crab caught in trawl surveys of the Cook Inlet Management Area, 1990-1998.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	0	1	0	0	0	0	0	0	1	2	3	4
1991	0	0	0	0	1	0	18	3	69	14	104	105
1992	0	2	2	0	0	0	1	1	11	31	44	48
1993	0	2	5	0	0	0	1	0	5	2	8	15
1994	4	0	0	0	0	0	0	0	1	6	7	11
1995	0	0	0	0	0	0	0	0	1	2	3	3
1996	0	1	0	0	0	0	0	1	1	2	4	5
1997	0	1	0	0	0	0	1	1	3	4	9	10
1998	0	0	0	0	0	0	0	0	0	0	0	0

Kamishak and Barren Islands Districts

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	0	0	0	1	0	2	0	1	1	4	6
1991	0	0	0	0	0	0	0	1	2	4	7	7
1992	0	2	1	0	1	0	2	2	8	10	22	26
1993	1	0	0	0	0	0	0	0	1	0	1	2
1994	0	0	0	0	0	0	0	0	1	2	3	3
1995	1	2	0	0	0	0	1	0	1	1	3	6
1996	0	12	14	0	3	0	0	1	1	0	2	31
1997	0	5	19	0	25	0	8	4	0	2	14	63
1998	0	0	0	0	2	0	11	0	1	0	12	14

Carapace lengths (mm) used for king crab size classes in Cook Inlet.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<91	91-108	109-126	127-144	145-163	>163

Table 14. Station catch per nautical mile by maturity and clutch size for female king crab in trawl surveys of Cook Inlet, 1998.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Station[a]	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
No Catch														

Kamishak and Barren Islands Districts Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Station[a]	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
46	0	1	0	0	2	2	0	0	0	0	3	2	0	5
Kamishak and Barren District Total														
Abund.	0	1	0	0	2	2	0	0	0	0	3	2	0	5
Percent	0%	20%	0%	0%	40%	40%	0%	0%	0%	0%	60%	40%	0%	100%

[a] - Stations not listed had no catch of female king crab.

Table 15. Historical catch per nautical mile of female king crab in trawl surveys of Cook Inlet, 1990-1998.

Southern District Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	2	0	0	0	0	0	0	0	0	0	0	0	0	2
1991	0	0	0	0	8	0	0	0	0	0	8	0	0	8
1992	1	19	0	0	59	0	0	2	0	0	80	0	0	81
1993	3	3	0	0	14	1	0	0	0	0	17	1	0	21
1994	6	2	0	0	2	0	0	0	0	0	4	0	0	10
1995	0	0	0	0	1	0	0	0	0	0	1	0	0	1
1996	0	0	0	0	0	0	0	1	0	1	1	0	1	2
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Kamishak and Barren Islands Districts Catches

		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	0	3	0	0	1	0	0	0	0	0	4	0	0	4
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	1	0	0	0	2	0	0	1	0	0	3	0	0	4
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	4	0	0	0	0	0	0	0	0	0	0	0	0	4
1996	2	0	0	0	7	0	0	0	0	0	7	0	0	9
1997	7	2	0	0	52	4	0	6	0	0	60	4	0	71
1998	0	1	0	0	2	2	0	0	0	0	3	2	0	5

Table 16. Station catch per nautical mile by carapace width and age for male Dungeness crab in a trawl survey of the Southern District, Cook Inlet, 1998.

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
1	0	0	0	0	1	0	0	1	0	0	1	2
2	0	0	0	0	1	0	0	0	0	1	1	2
3	0	0	0	0	0	1	0	0	0	0	0	1
7	0	0	0	0	0	0	0	1	0	0	0	1
71	0	0	0	0	0	1	0	0	0	0	0	1
Southern District Total												
Total	0	0	0	0	2	2	0	2	0	1	3	7
Percent	0%	0%	0%	0%	29%	29%	0%	29%	0%	14%	43%	100%

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 17. Historical catch per nautical mile by carapace length and age for male Dungeness crab caught in trawl surveys of the Southern District, Cook Inlet, 1990-1998.

Southern District

	Sublegal Males						Legal Males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Year	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1990	1	17	189	5	91	7	6	1	0	0	7	317
1991	0	1	15	2	158	12	45	1	0	0	46	234
1992	0	0	19	2	93	31	54	10	1	1	66	211
1993	0	0	0	3	50	7	67	9	0	0	76	136
1994	0	0	2	0	7	3	13	12	0	0	25	37
1995	0	2	97	1	46	3	5	5	0	0	10	159
1996	0	0	3	16	43	56	1	1	28	28	58	176
1997	0	1	1	1	1	7	3	1	0	0	4	15
1998	0	0	0	0	2	2	0	2	0	1	3	7

Carapace widths (mm) used for Dungeness crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<89	90-114	115-139	140-164	165-189	>189

Table 18. Station catch per nautical mile by carapace age and clutch fullness for female Dungeness crab in a trawl survey of the Southern District, Cook Inlet, 1998.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1	0	0	0	0	0	0	0	0	1	1	0	1	1	2
2	0	0	0	0	0	0	0	6	0	0	6	0	0	6
3	0	0	0	0	0	0	0	0	1	0	0	1	0	1
7	0	0	0	0	0	0	0	0	0	1	0	0	1	1
21	0	0	0	0	0	0	0	0	0	1	0	0	1	1
71	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Southern District Total														
Abund.	0	0	0	0	0	0	0	6	2	4	6	2	4	12
Percent	0%	0%	0%	0%	0%	0%	0%	50%	17%	33%	50%	17%	33%	100%

Table 19. Historical catches of female Dungeness crab in trawl surveys of the Southern District, Cook Inlet, 1990-1998.

		Southern District Catches												
		Full Clutches			Partial Clutches			Barren			Total Mature			
Year	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
1990	NA[a/]	0	8	0	0	0	0	2	13	0	2	21	0	23
1991	0	37	7	0	8	2	0	408	14	0	453	23	0	476
1992	0	0	1	0	0	0	0	397	78	0	397	79	0	476
1993	7	0	0	0	0	0	0	377	150	0	377	150	0	534
1994	0	0	0	0	0	0	0	43	69	2	43	69	2	114
1995	0	8	1	1	0	0	0	105	10	0	113	11	1	125
1996	0	0	0	0	0	0	0	96	167	107	96	167	107	370
1997	0	1	0	0	0	0	0	12	70	7	13	70	7	90
1998	0	0	0	0	0	0	0	6	2	4	6	2	4	12

[a/] - Juveniles were not distinguished in the 1990 survey.

Table 20. Catch abundance by carapace size and age per mile towed of male Tanner crab during a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1998.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
30	0	0	0	0	0	0	0	0	0	0	0	0
32	6	3	0	10	0	33	0	3	0	0	3	55
33	11	0	0	1	0	0	0	3	0	0	3	15
34	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	2	0	2	0	0	2	4
38	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	1	0	0	0	0	0	1
44	0	0	0	1	0	1	0	0	0	0	0	2
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	4	0	0	2	0	6	0	0	0	0	0	12
48	0	0	0	1	1	3	0	0	0	0	0	5
50	0	0	0	0	0	0	0	1	0	0	1	1
51	0	0	0	0	0	5	0	2	0	0	2	7
52	0	0	0	0	0	0	0	0	0	0	0	0
53	5	1	0	0	7	4	8	2	0	0	10	27
56	2	0	0	0	0	0	0	0	0	0	0	2
57	0	0	0	0	0	2	0	0	0	0	0	2
58	22	3	0	0	0	7	0	2	0	0	2	34
60	4	2	0	0	0	0	0	0	0	0	0	6
61	4	0	0	0	0	0	0	0	0	0	0	4
67	15	0	0	2	0	3	0	0	0	0	0	20
68	11	0	0	0	0	14	0	7	0	0	7	32
Kamishak and Barren Islands Districts Total												
Total	84	9	0	17	8	81	8	22	0	0	30	229
Percent	37%	4%	0%	7%	4%	35%	4%	10%	0%	0%	13%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 21. Population estimate of male Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, 1998.

	Sublegal Males						Legal Males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Legal	Males
30	0	0	0	0	0	0	0	0	0	0	0	0
32	23,806	11,903	0	39,676	0	130,932	0	11,903	0	0	11,903	218,220
33	43,644	0	0	3,968	0	0	0	11,903	0	0	11,903	59,514
34	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	7,935	0	7,935	0	0	7,935	15,871
38	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	2,558	0	0	0	0	0	2,558
44	0	0	0	3,968	0	3,968	0	0	0	0	0	7,935
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	14,613	0	0	7,306	0	21,919	0	0	0	0	0	43,838
48	0	0	0	3,916	3,916	11,748		0	0	0	0	19,580
50	0	0	0	0	0	0	0	3,968	0	0	3,968	3,968
51	0	0	0	0	0	19,838	0	7,935	0	0	7,935	27,773
52	0	0	0	0	0	0	0	0	0	0	0	0
53	19,838	3,968	0	0	27,773	15,871	31,741	7,935	0	0	39,676	107,126
56	7,935	0	0	0	0	0	0	0	0	0	0	7,935
57	0	0	0	0	0	7,935	0	0	0	0	0	7,935
58	75,558	10,303	0	0	0	24,041	0	6,869	0	0	6,869	116,772
60	15,871	7,935	0	0	0	0	0	0	0	0	0	23,806
61	14,170	0	0	0	0	0	0	0	0	0	0	14,170
67	59,514	0	0	7,935	0	11,903	0	0	0	0	0	79,353
68	43,644	0	0	0	0	55,547	0	27,773	0	0	27,773	126,964
Kamishak and Barren Islands Districts Total												
Total	318,593	34,109	0	66,769	31,689	314,195	31,741	86,221	0	0	117,963	883,318
Percent	36%	4%	0%	8%	4%	36%	4%	10%	0%	0%	13%	100%

Carapace widths (mm) used for Tanner crab size classes.

Class	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Post Recruit
mm	<70	70-91	92-114	115-139	140-165	>165

Table 22. Catch per nautical mile by carapace age and clutch fullness for female Tanner crab in a trawl survey of the Kamishak and Barren Islands Districts, Cook Inlet, 1998.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	6	0	0	0	1	0	0	0	0	0	0	0	0	7
33	10	0	0	0	0	0	0	0	0	0	0	0	0	10
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	5	0	0	0	0	0	0	0	0	0	0	0	0	5
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	2	0	1	0	0	0	0	0	0	0	0	0	0	3
56	1	0	0	0	0	0	0	0	0	0	0	0	0	1
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	22	0	0	0	0	0	0	0	0	0	0	0	0	22
60	1	0	0	0	0	0	0	0	0	0	0	0	0	1
61	2	0	0	0	0	0	0	0	0	0	0	0	0	2
67	12	0	0	0	0	0	0	0	0	0	0	0	0	12
68	14	0	0	0	0	0	0	0	0	0	0	0	0	14
Kamishak and Barren Islands Districts Total														
Abund.	75	0	1	0	1	0	0	0	0	0	1	1	0	77
Percent	97%	0%	1%	0%	1%	0%	0%	0%	0%	0%	1%	1%	0%	100%

Table 23. Population estimate by carapace condition and clutch fullness of female Tanner crab in the Kamishak and Barren Islands Districts, Cook Inlet, 1998.

		Full Clutches			Partial Clutches			Barren			Total mature			
Station	Juveniles	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	New	Old	Very Old	Total Females
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	23,806	0	0	0	3,968	0	0	0	0	0	3,968	0	0	27,773
33	39,676	0	0	0	0	0	0	0	0	0	0	0	0	39,676
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	18,266	0	0	0	0	0	0	0	0	0	0	0	0	18,266
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	7,935	0	3,968	0	0	0	0	0	0	0	0	3,968	0	11,903
56	3,968	0	0	0	0	0	0	0	0	0	0	0	0	3,968
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	75,558	0	0	0	0	0	0	0	0	0	0	0	0	75,558
60	3,968	0	0	0	0	0	0	0	0	0	0	0	0	3,968
61	7,085	0	0	0	0	0	0	0	0	0	0	0	0	7,085
67	47,612	0	0	0	0	0	0	0	0	0	0	0	0	47,612
68	55,547	0	0	0	0	0	0	0	0	0	0	0	0	55,547
					Kamishak and Barren Islands Districts Total									
Abund.	283,420	0	3,968	0	3,968	0	0	0	0	0	3,968	3,968	0	291,355
Percent	97%	0%	1%	0%	1%	0%	0%	0%	0%	0%	1%	1%	0%	100%

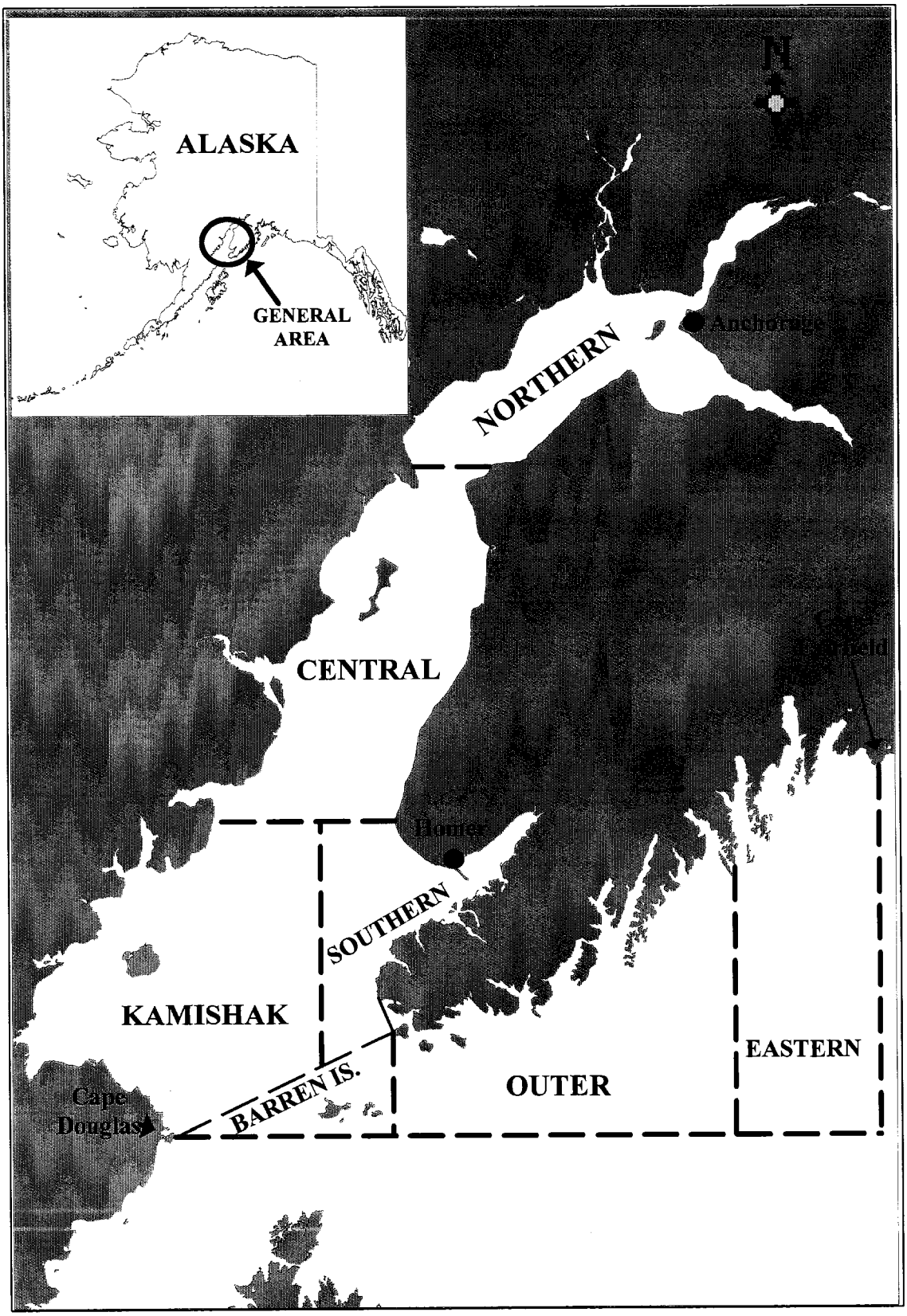

Figure 1. Crab management districts in the Cook Inlet Management Area.

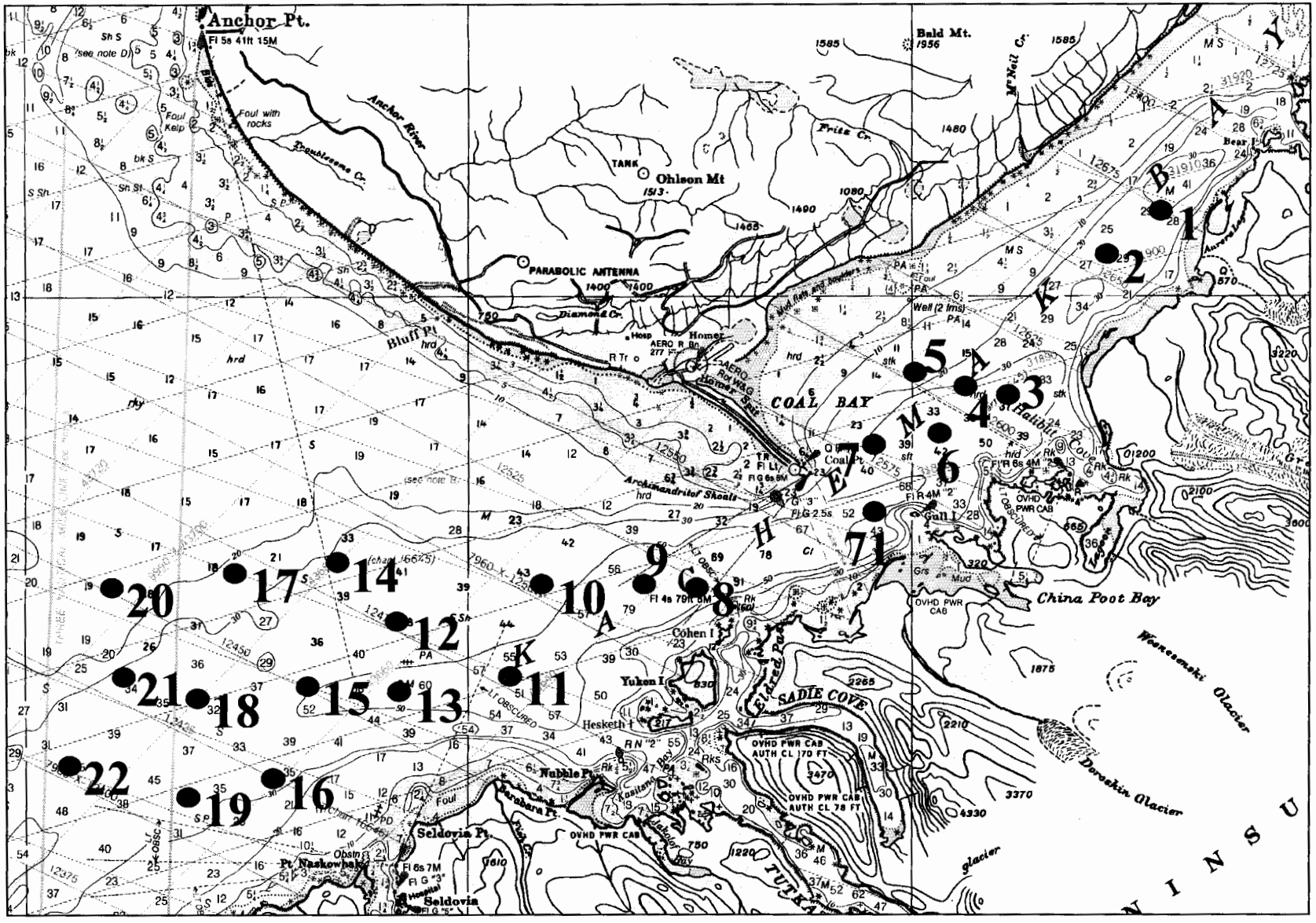

Figure 2. Survey stations in a bottom trawl survey of the Southern District, Cook Inlet, during 13-20 August 1998.

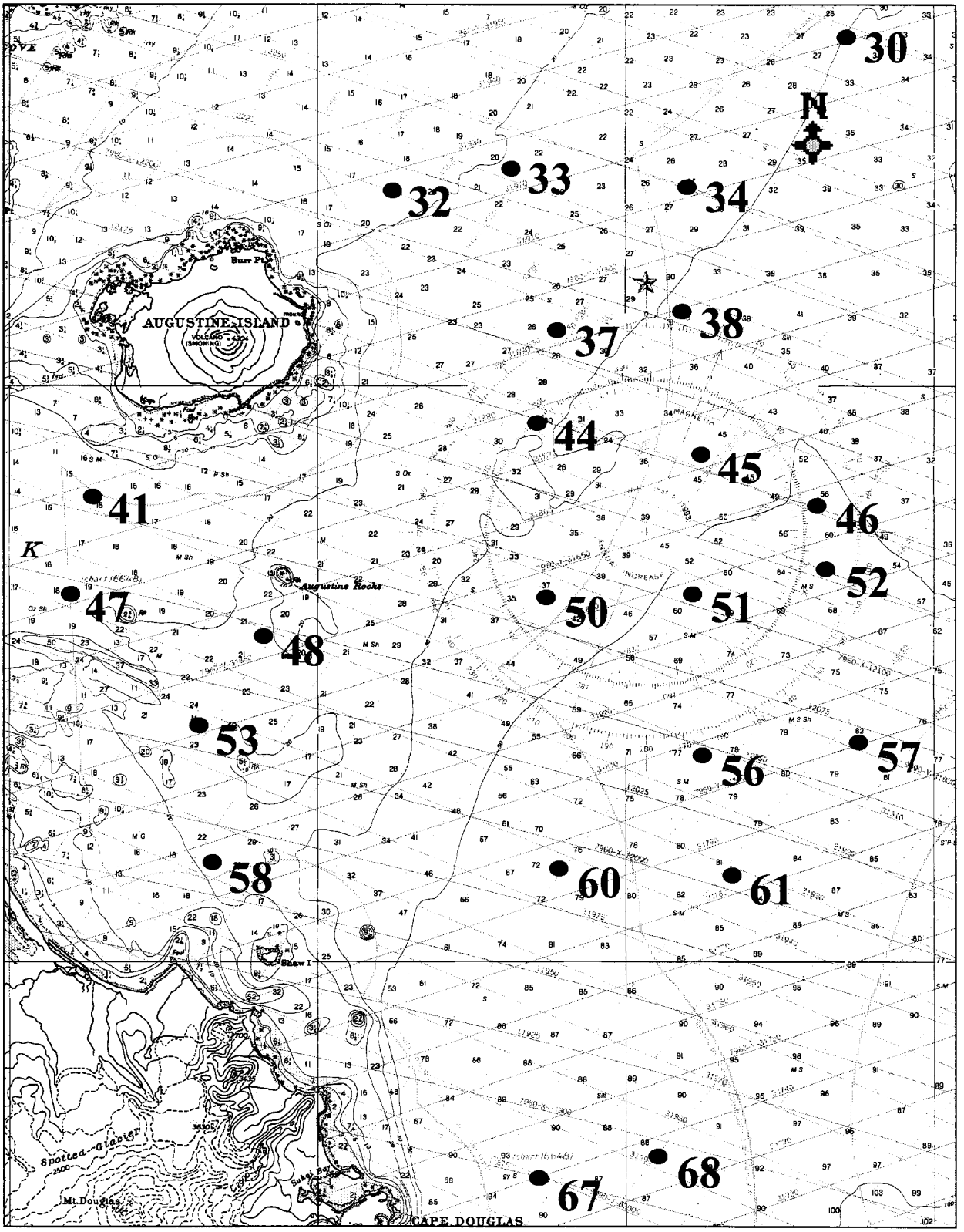

Figure 3. Survey stations in a bottom trawl survey of the Kamishak and Barren Islands District, Cook Inlet, during 16-30 June 1998.

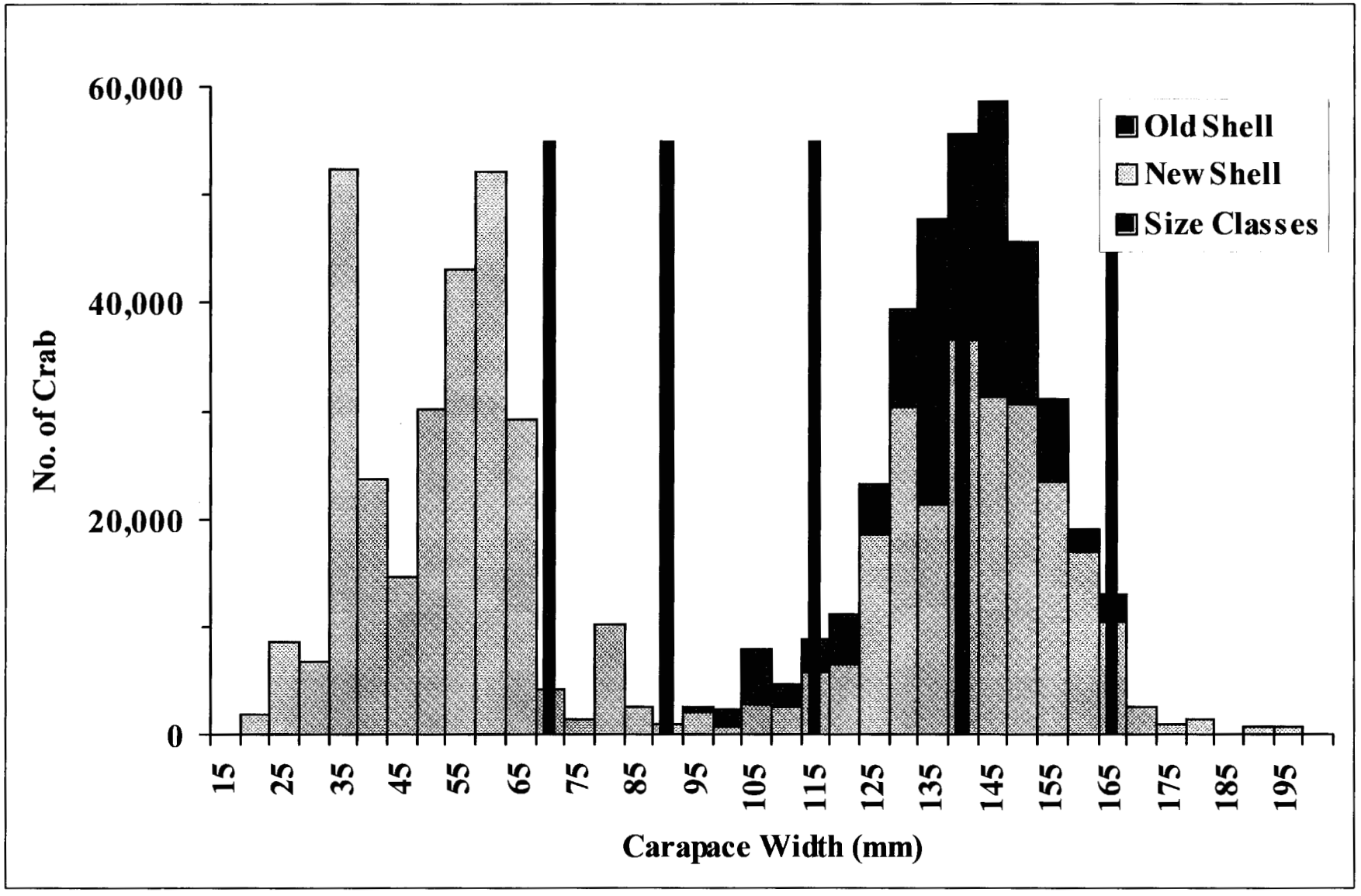

Figure 4. Size and age composition of the male Tanner crab population in the Southern District, Cook Inlet, 1998.

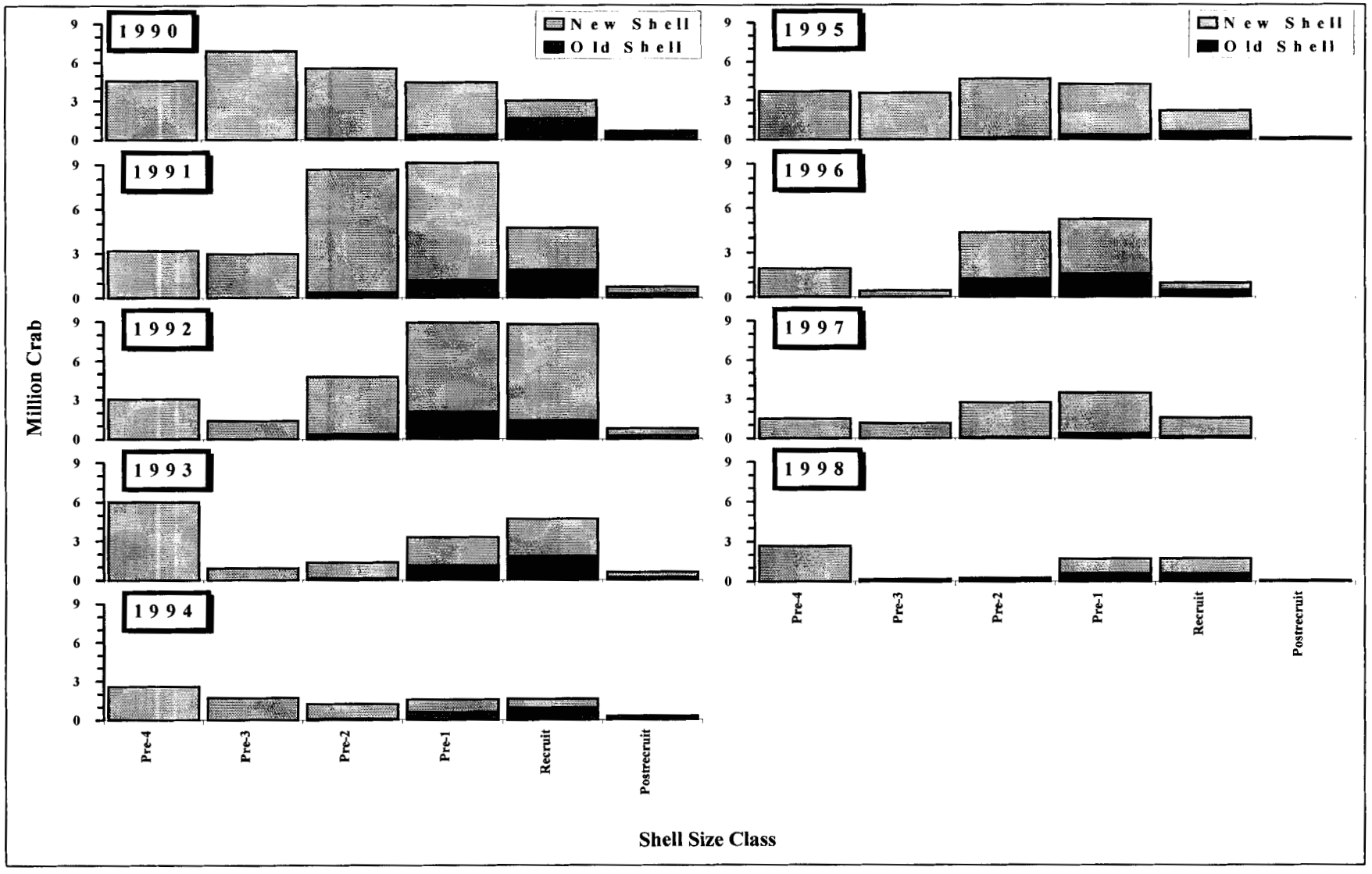

Figure 5. Estimated population abundance, by shell size and age composition, of male Tanner crab in the Southern District, 1990-1998.

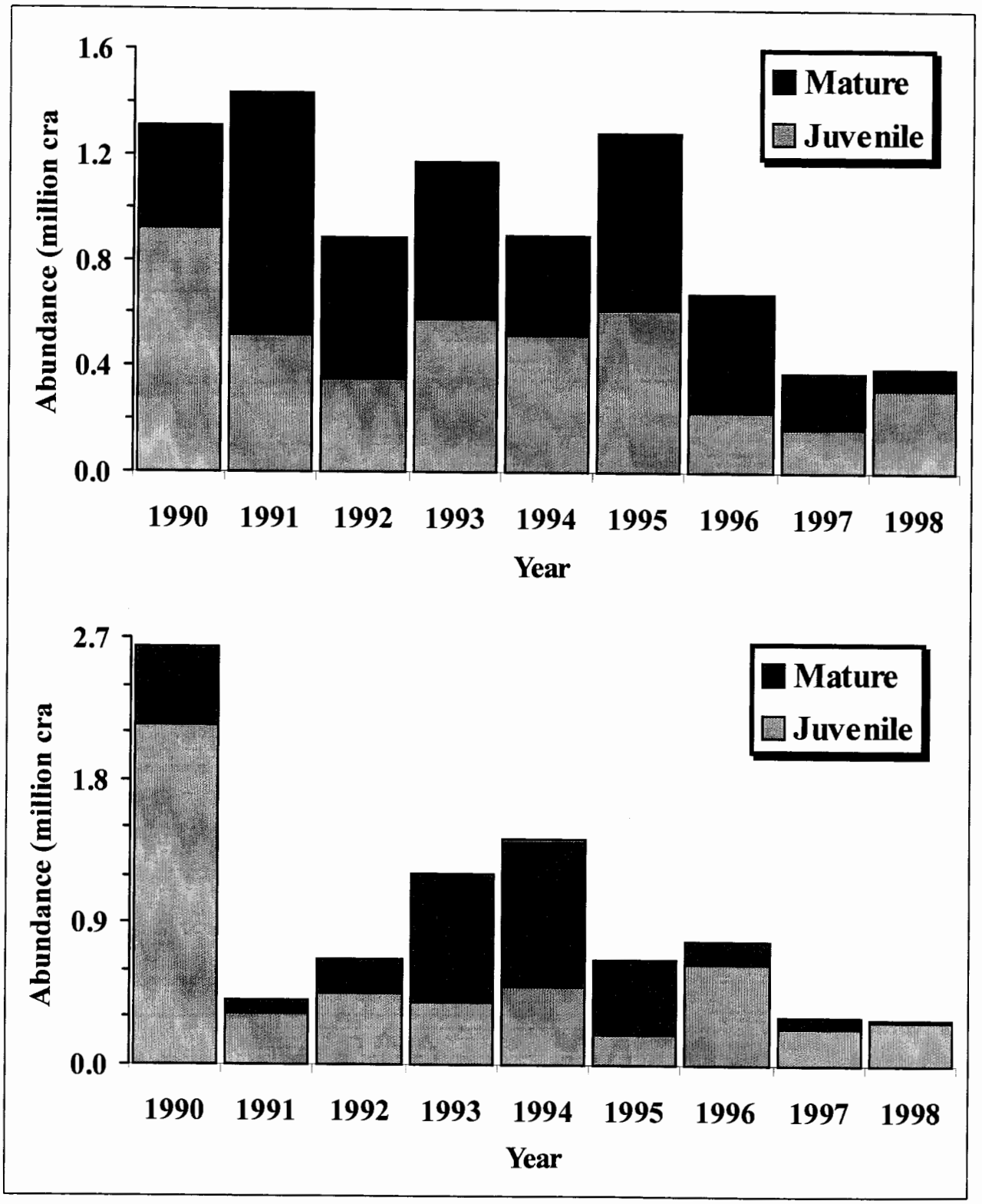

Figure 6. Abundance and maturity of female Tanner crab in the Southern District and the Kamishak and Barren Islands Districts, 1990-1998.

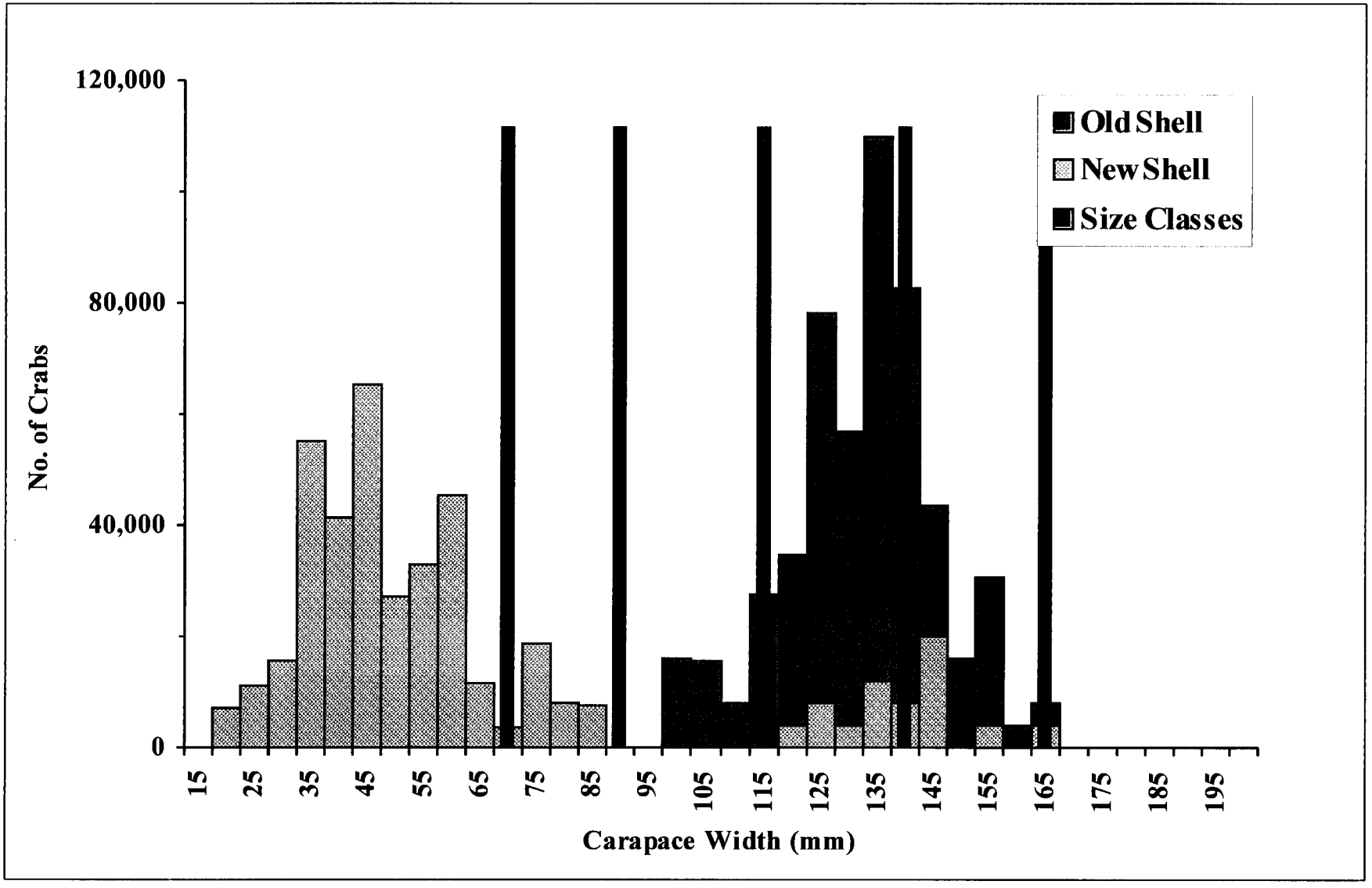

Figure 7. Size and age composition of the male Tanner crab population in the Kamishak and Barren Islands Districts, 1998.

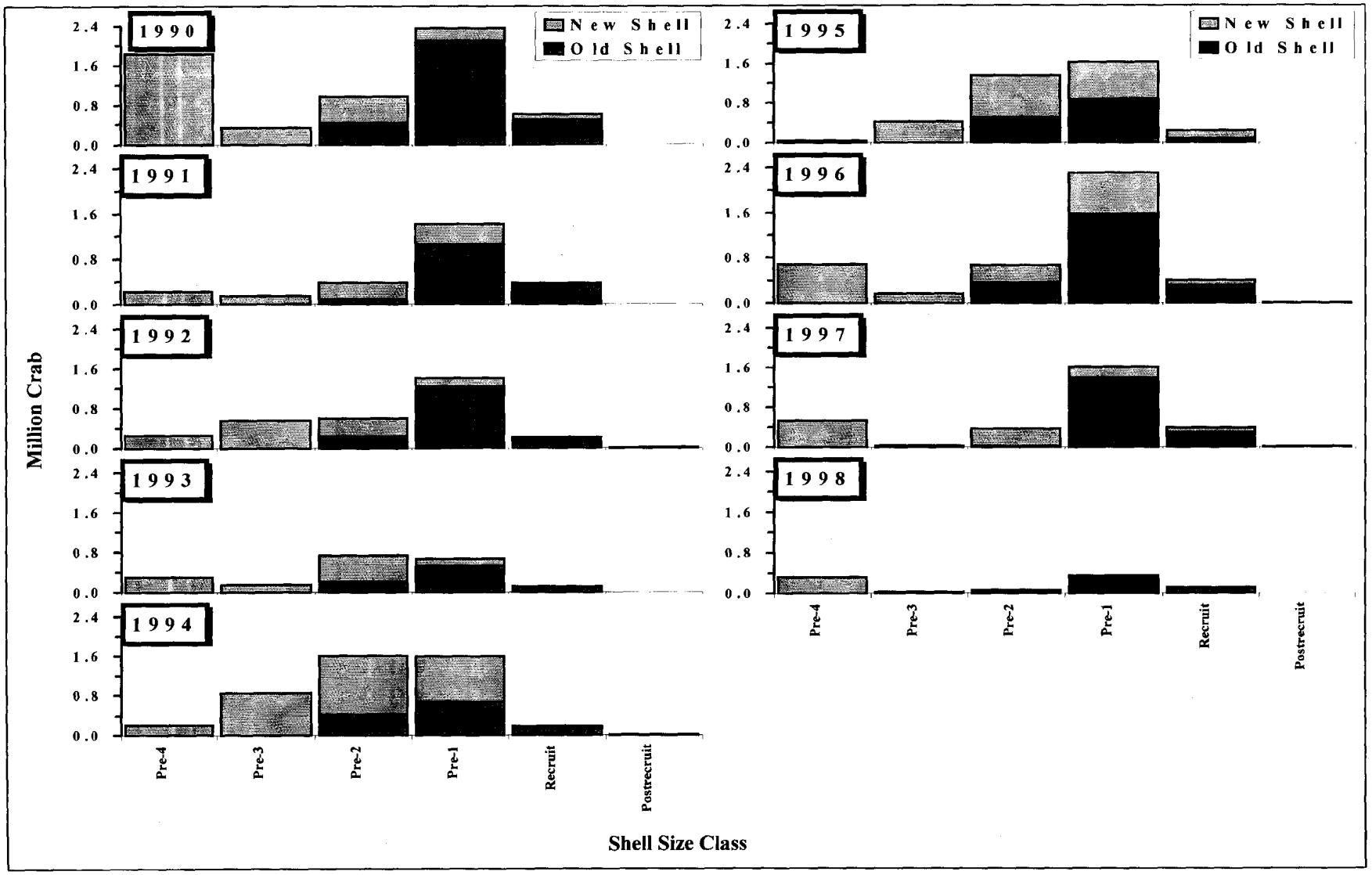

Figure 8. Estimated population abundance, by shell size and age composition, of male Tanner crab in the Kamishak and Barren Islands Districts, 1990-1998.

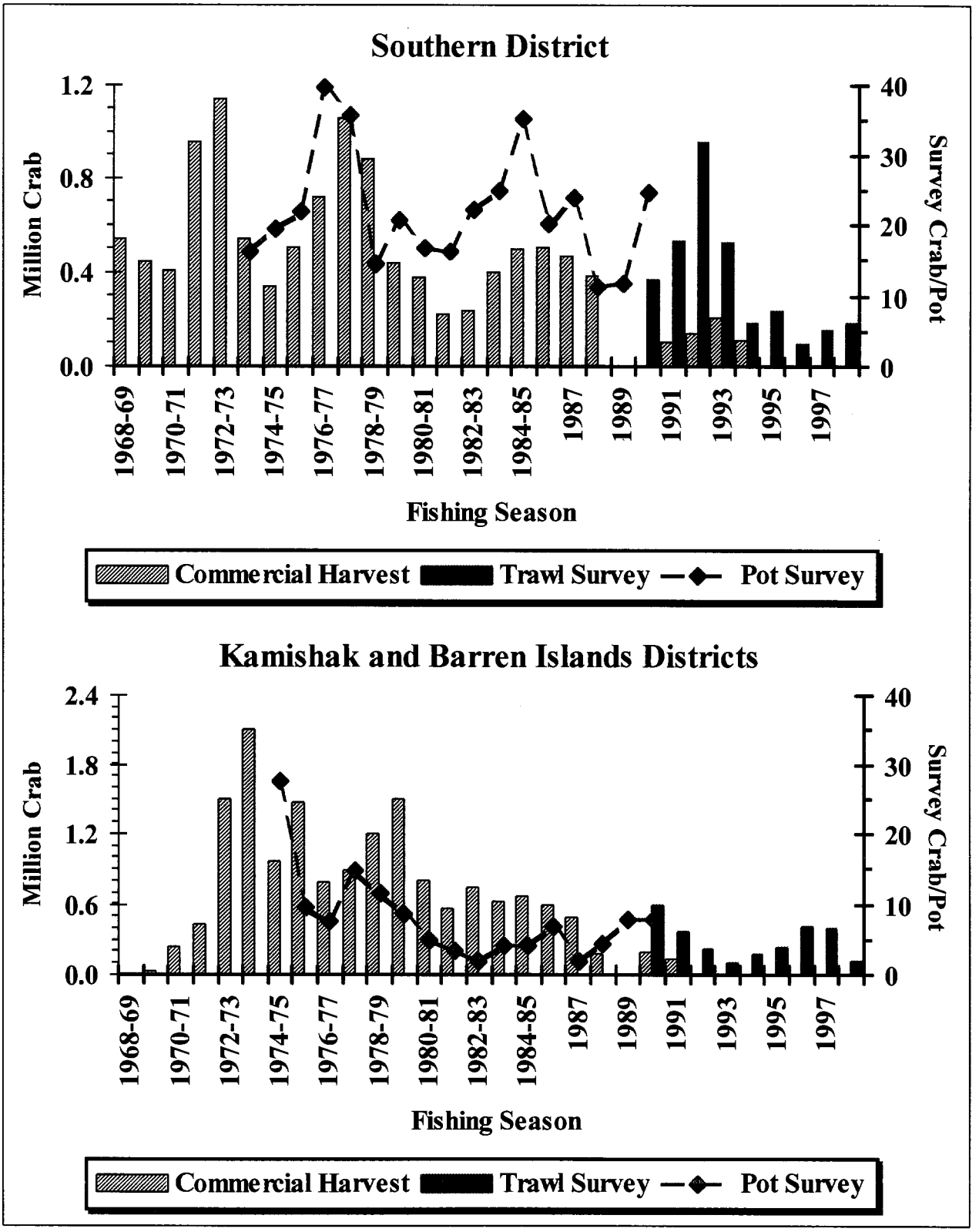

Figure 9. Historical fishery harvests and pot and bottom trawl survey catches of legal male Tanner crab in the Southern, Kamishak, and Barren Island Districts, 1968-1998.

Appendix A. Fishing log and aggregate catch (lb) in the Cook Inlet Southern District trawl survey, 18-20 August 1998.

Station	Area (nmi^2)	Date	Tow Start Location Latitude	Tow Start Location Longitude	Course (deg.)	Duration (minutes)	Distance (nmi)	Scope (fathom)	Depth (fathom) Min.	Depth (fathom) Max.	Catch (lb)
1	4.98	18-Aug	59° 42.39'	151° 08.25'	187	22	1.0	100	39	39	982
2	2.92	18-Aug	59° 40.70'	151° 12.01'	048	19	1.0	75	27	28	766
3	5.52	18-Aug	59° 38.25'	151° 14.46'	195	21	1.0	100	33	38	444
4	3.08	18-Aug	59° 37.93'	151° 18.28'	062	18	0.9	100	30	31	956
5	5.94	17-Aug	59° 38.66'	151° 19.26'	209	37	1.0	50	15	18	1,240
6	5.00	18-Aug	59° 36.79'	151° 19.61'	041	19	0.9	125	40	40	1,888
7	3.93	18-Aug	59° 36.45'	151° 22.44'	011	21	1.0	125	32	35	1,426
8	3.57	19-Aug	59° 33.75'	151° 28.72'	021	22	1.0	260	86	89	1,522
9	4.59	14-Aug	59° 33.41'	151° 32.87'	048	26	1.0	200	64	67	1,878
10	8.52	20-Aug	59° 33.50'	151° 37.58'	060	23	1.0	150	46	47	1,001
11	4.63	19-Aug	59° 31.81'	151° 37.19'	221	27	1.1	175	56	57	1,744
12	6.25	13-Aug	59° 32.80'	151° 44.07'	062	22	1.0	125	39	43	1,686
13	6.25	19-Aug	59° 31.29'	151° 42.06'	230	23	1.0	175	59	60	1,798
14	6.64	19-Aug	59° 33.93'	151° 46.74'	052	21	1.0	100	33	35	3,358
15	3.68	14-Aug	59° 31.23'	151° 48.16'	045	26	1.0	125	40	41	1,664
16	3.26	19-Aug	59° 29.27'	151° 49.31'	062	12	0.6	125	37	38	686
17		13-Aug	59° 34.31'	151° 50.09'	208	20	1.0	75	19	22	Ripped Net
17	8.94	13-Aug	59° 34.34'	151° 49.91'	201	25	1.0	50	19	23	1,566
18	6.25	14-Aug	59° 30.98'	151° 52.57'	042	12	0.6	100	34	35	217
19	6.25	14-Aug	59° 29.09'	151° 51.65'	201	25	1.0	100	35	45	1,271
20	6.25	13-Aug	59° 33.88'	151° 55.16'	210	25	1.0	50	18	20	3,354
21	6.25	13-Aug	59° 31.27'	151° 54.94'	210	29	0.9	100	23	35	858
22	6.25	14-Aug	59° 29.71'	151° 57.02'	208	21	1.0	100	33	43	1,540
71	3.42	18-Aug	59° 35.32'	151° 22.53'	048	22	0.8	175	53	73	1,204
Total							21.7		15	89	33,049

Appendix B. Fishing log and aggregate catch (lb) in the Cook Inlet Kamishak District trawl survey, 16-30 June 1998.

Station	Area (nmi^2)	Date	Tow Start Location Latitude	Tow Start Location Longitude	Course (deg.)	Duration (minutes)	Distance (nmi)	Scope (fathom)	Depth (fathom) Min.	Depth (fathom) Max.	Catch (lb)
30	26.1	28-Jun	59° 32.48'	152° 45.49'	117	:25	1.0	100	27	30	173
32	26.1	20-Jun	59° 27.11'	153° 15.81'	120	:30	1.0	50	17	19	550
33	26.1	28-Jun	59° 27.86'	153° 08.22'	120	:30	1.0	65	20	22	850
34	26.1	28-Jun	59° 26.41'	152° 56.59'	025	:27	1.0	75	25	26	884
37	26.1	29-Jun	59° 21.87'	153° 03.49'	260	:27	1.0	85	25	27	590
38	26.1	29-Jun	59° 22.29'	152° 57.19'	025	:30	1.0	90	29	31	475
41	16.8	30-Jun	59° 16.45'	153° 35.48'	100	:27	1.0	50	16	17	508
44	26.1	29-Jun	59° 18.63'	153° 06.77'	035	:28	1.0	100	29	29	1,520
45	26.1	29-Jun	59° 17.55'	152° 56.15'	035	:30	1.0	125	40	45	1,498
46	26.1	29-Jun	59° 15.65'	152° 48.45'	020	:29	1.0	150	53	55	105
47	24.1	30-Jun	59° 13.33'	153° 36.45'	145	:27	1.0	60	18	19	644
48	26.1	30-Jun	59° 10.91'	153° 23.22'	305	:29	1.0	60	20	21	467
50	26.1	18-Jun	59° 12.28'	153° 05.69'	025	:26	1.0	125	39	39	1,184
51	26.1	18-Jun	59° 12.92'	152° 56.69'	095	:30	1.0	175	56	63	1,560
52	26.1	17-Jun	59° 13.91'	152° 47.91'	103	:19	1.0	175	61	64	1,842
53	26.1	30-Jun	59° 07.86'	153° 27.24'	300	:30	1.0	75	23	23	465
56	26.1	17-Jun	59° 06.79'	152° 54.76'	315	:27	1.0	250	78	79	1,248
57	26.1	17-Jun	59° 07.26'	152° 44.32'	285	:31	1.0	225	79	81	3,392
58	22.6	17-Jun	59° 03.08'	153° 26.25'	286	:26	1.0	75	23	23	510
60	26.1	17-Jun	59° 03.18'	153° 05.11'	047	:25	1.0	225	74	77	524
61	26.1	16-Jun	59° 03.16'	152° 52.46'	204	:13	0.6	250	81	81	522
67	26.1	16-Jun	58° 52.29'	153° 04.82'	280	:29	1.0	275	89	92	1,984
68	26.1	16-Jun	58° 53.07'	152° 56.94'	233	:27	1.0	275	88	89	1,234
Total							22.6		16	92	22,729

Appendix C. Catch rates (lb/nmi) of all species or species groups caught in a bottom trawl survey of the Southern District, 1998.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Dusky Rockfish	Rougheye Rockfish	Redbanded Rockfish	Redstripe Rockfish	Sablefish	Pacific Halibut	Spiny Dogfish	Skate, Unid.	Arrowtooth Flounder	Flathead Sole	Rock Sole	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder
1	31.7	47.5							53.5		158.4	31.1	135.0			0.2		62.3		10.4
2	40.0	50.0	2.6						118.0		98.0	98.0	42.0			0.5		77.8		
3	10.0	20.0			0.1						142.0	27.4	192.2	1.9				19.7		
4	6.5	26.1							54.3		287.0	4.5	74.6		0.4			27.1		
5	20.8	2.1	2.8				0.5		7.3		127.1	7.3	77.1	3.0	0.8	0.6		108.3		
6	8.7	34.8									371.7	2.2	106.5		123.9			212.4		
7	6.0	24.0						2.6	42.0		265.3	157.4	514.1	0.8	8.7			80.3		
8	44.0	8.0			6.0			12.0	74.0		24.0	222.5	556.3		127.2	31.5				
9	16.0	255.1		3.7	7.5						126.0	714.5	314.4			17.3				
10	10.0	208.0		2.6	3.1			8.0	18.0		4.0	248.6	383.3	3.4	33.1	25.1	5.7			
11	47.3	132.7		15.9	4.8	3.0		2.4	18.2		39.1	353.5	439.4		22.1	66.3				
12	2.0	158.0	0.6	4.0				14.0	8.0		60.0	279.1	380.5		203.0	11.2	507.4			
13	28.0	258.0		6.0	10.0				6.0		192.8	207.2	63.7		47.8	318.7	63.7		334.5	
14	0.7	102.0		8.0							192.0	168.3	112.0	9.3	12.4	86.6	1,711.7		24.7	674.4
15	12.0	180.0	9.7					1.1	8.0		198.0		29.6			27.3	656.7		29.2	218.9
16	610.9			167.3					76.4			61.8	5.4	160.6	13.6					
17	2.0			5.0				12.0	32.0		39.0	29.8			1.8		869.7		6.3	361.0
18	18.2		8.0	7.3				2.0	18.2			10.9	4.0			1.0	305.5		6.4	40.0
19	36.0			22.0				2.0	70.0		64.0	33.3		122.9						
20	1.5								40.0		80.0			395.3			1,927.0			
21	135.6		3.4	97.8				1.1	15.6		24.4	10.5		29.8	5.0		486.8		42.2	
22	784.9	2.0							111.0		60.0	13.2		131.7		2.9	158.1			
71	45.8	33.7								12.0	969.4	62.7	156.6	2.4	12.7					
Total	1,918.5	1,542.0	27.0	339.6	31.5	3.0	0.5	57.3	770.4	12.0	3,522.2	2,743.8	3,586.9	861.1	612.4	589.5	6,692.4	587.9	443.3	1,304.8
Freq.	100%	74%	26%	48%	26%	4%	4%	43%	78%	4%	91%	91%	78%	48%	61%	57%	43%	30%	26%	22%
Mean	83.4	67.0	1.2	14.8	1.4	0.1	0.0	2.5	33.5	0.5	153.1	119.3	156.0	37.4	26.6	25.6	291.0	25.6	19.3	56.7

Appendix C. (page 2 of 3)

Station	Alaska Plaice	Sculpin, Unid.	Greenling, Unid.	Giant Wrymouth	Pacific Herring	Eulachon	Searcher/Ronquil	Sturgeon poacher	Eelpout	Other Vertebrates	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Other Crab	Weathervane Scallop	Other Scallop	Octopus	Other Bivalves	Snail, Unid.	Shrimp, Unid.
1	166.0	188.0			1.1			1.1	1.7	0.1	4.8		35.1	2.3		0.7					7.8
2	30.0	117.7						0.3	2.6		7.8		42.0	1.7		0.4					27.9
3	15.1								0.4		4.5		0.7	2.3		3.1					2.4
4	22.0	21.4							3.7	0.0	1.2		7.2	0.7		6.9			0.0	1.5	448.3
5	4.4	77.1	2.1		3.7				0.0	2.1				0.0			0.0		0.0	0.1	
6		192.5							24.8				9.2	28.3							10.6
7	61.4	171.3							10.5		2.3		7.5	7.9	1.6	4.2					11.0
8				4.0						8.0			223.7	3.5						14.0	0.2
9		20.5											210.0	5.5	1.6					1.6	86.6
10		5.1											15.5	5.7						4.6	2.9
11		5.3		7.3					0.5				370.1	9.0		0.2			0.9	9.5	0.5
12		1.4				2.0		4.5					24.0			2.0					
13		50.4						0.9	1.8				94.4	3.5	3.5			14.0	6.1	29.0	
14	140.8	84.1					3.1	3.1											3.1	3.1	
15	189.7	3.2											92.0								0.5
16		42.5								1.4				0.7	6.8				2.7	6.8	
17		65.6						4.5						1.8							
18		5.2			0.4			1.6		0.4				2.0						2.4	
19		6.1								0.3							33.3			24.2	
20											1.0				2.2						
21		19.7						3.4											1.3		
22		2.9			5.1			2.9						30.5						65.3	
71									36.4		2.9			25.5	4.2					25.5	7.7
Total	629.5	1,080.1	2.1	11.3	10.3	2.0	3.1	22.4	82.4	12.3	24.6	0.0	1,131.5	130.9	19.8	17.5	33.3	14.0	14.3	187.6	606.4
Freq.	35%	83%	4%	9%	17%	4%	4%	39%	43%	30%	30%	0%	57%	74%	26%	30%	9%	4%	30%	57%	52%
Mean	27.4	47.0	0.1	0.5	0.4	0.1	0.1	1.0	3.6	0.5	1.1	0.0	49.2	5.7	0.9	0.8	1.4	0.6	0.6	8.2	26.4

Appendix C. (page 3 of 3)

Station	Red Sea Urchin	Green Sea Urchin	Sea Cucumber	Anenome	Sea Pen	Sea Star	Other Invertebrates	Debris	
1				1.1					32.1
2									8.6
3						1.5			0.8
4			0.1	5.6		12.7	0.1		27.1
5				11.2		47.9	0.1		
6				123.9					802.7
7									47.2
8		14.0		113.9					35.0
9						0.8	1.6		95.3
10				10.3					4.0
11		2.6	3.2	29.5					2.1
12		7.0		10.5		7.0			
13		29.9		21.1		3.5			3.5
14				9.3		9.3			
15									8.0
16	6.8	61.8		9.5		5.4			6.8
17				21.7			113.6		
18		0.8	1.6	18.2	1.6	0.4			2.4
19		769.1				69.6			18.2
20			46.3	395.3			20.7		444.7
21		6.0	5.4	59.6					5.8
22		105.4	33.4		2.9	5.8	1.6		20.4
71			5.6	11.2			36.3		
Total	6.8	996.6	95.5	851.8	4.5	164.0	173.9		1,564.8
Freq.	4%	39%	30%	70%	9%	48%	30%		78%
Mean	0.3	43.3	4.2	37.0	0.2	7.1	7.6		68.0

Appendix D. Population biomass estimates in surveyed stations for species caught in a bottom trawl survey of the Southern District, 1998.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Dusky Rockfish	Rougheye Rockfish	Redbanded Rockfish	Redstripe Rockfish	Pacific Halibut	Sablefish	Spiny Dogfish	Skate, Unid.	Arrowtooth Flounder	Flathead Sole	Rock Sole	Dover Sole
1	23,967	35,951						40,445			119,836	23,562	102,130		
2	17,742	22,177	1,142					52,339			43,468	43,468	18,629		
3	8,385	16,770			92						119,065	22,968	161,157	1,586	
4	3,051	12,205						25,427			134,253	2,097	34,880		175
5	18,798	1,880	2,486				470	6,579			114,666	6,631	69,551	2,694	725
6	6,604	26,417									282,336	1,651	80,903		94,081
7	3,582	14,327						25,073	1,579		158,375	93,963	306,884	470	5,168
8	23,860	4,338			3,254			40,129	6,507		13,015	120,679	301,681		68,983
9	11,156	177,848		2,613	5,226						87,850	498,177	219,198		
10	12,942	269,191		3,365	3,986			23,295	10,354		5,177	321,714	496,093	4,433	42,856
11	33,247	93,347		11,216	3,383	2,114		12,787	1,691		27,493	248,592	309,061		15,553
12	1,899	150,001	531	3,798				7,595	13,291		56,963	264,937	361,278		192,682
13	26,583	244,939		5,696	9,494			5,696			183,040	196,709	60,513		45,343
14	667	102,879		8,069							193,654	169,747	112,957	9,361	12,481
15	6,708	100,619	5,396					4,472	616		110,680		16,546		
16	302,519			82,832				37,815				30,590	2,698	79,535	6,744
17	2,716			6,790				43,456	16,296		52,961	40,531			2,456
18	17,261		7,611	6,905				17,261	1,903			10,357	3,805		
19	34,178			20,886				66,456	1,899		60,760	31,619		116,702	
20	1,465							37,975			75,950			375,274	
21	128,693		3,223	92,828				14,768	1,055		23,207	9,981		28,296	4,716
22	745,159	1,899						105,381			56,963	12,506		125,055	
71	23,784	17,525								6,259	503,600	32,547	81,367	1,236	6,619
Total	1,454,965	1,292,312	20,389	244,998	25,435	2,114	470	566,948	55,191	6,259	2,423,310	2,183,027	2,739,332	744,643	498,582

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Station	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Greenling, Unid.	Giant Wrymouth	Pacific Herring	Eulachon	Searcher/Ronquil	Sturgeon poacher	Eelpout	Other Vertebrates
1	173		47,124		7,883	125,606	142,237			866			866	1,299	87
2	228		34,525			13,323	52,188						152	1,142	
3			16,496			12,690								317	
4			12,688			10,305	10,032							1,748	17
5	518		97,748			3,937	69,551	1,865		3,315				21	1,865
6			161,282				146,229							18,816	
7			47,921			36,646	102,232							6,296	
8	17,103								2,169						4,338
9	12,081						14,278								
10	32,511	7,389					6,650								
11	46,658						3,703		5,115					370	
12	10,620	481,704					1,327				1,858		4,248		
13	302,566	60,513		317,569			47,844						834	1,667	
14	87,370	1,726,493		24,963	680,238	141,976	84,874					3,120	3,120		
15	15,287	367,108		16,316	122,369	106,053	1,799								
16							21,052				674				
17		1,181,090		8,598	490,264		89,139						6,141		
18	989	289,991		6,089	37,975		4,947			381			1,522		381
19							5,749								287
20		1,829,463													
21		462,174		40,029			18,715						3,223		
22	2,757	150,066					2,757			4,825			2,757		
71														18,910	
Total	528,862	6,555,990	417,785	413,562	1,338,729	450,536	825,301	1,865	7,284	9,387	2,533	3,120	22,864	50,586	6,975

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Station	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Other Crab	Octopus	Weathervane Scallop	Other Scallop	Other Bivalves	Snail, Unid.	Shrimp, Unid.	Red Sea Urchin	Green Sea Urchin	Sea Cucumber	Anenome
1	3,633		26,589	1,732			494				5,890				866
2	3,471		18,629	761			196				12,371				
3	3,782		555	1,903			2,588				2,030				
4	561		3,363	350			3,251		17	699	209,718			35	2,621
5				41				21	21	124					10,091
6			7,009	21,504							8,064				94,081
7	1,379		4,475	4,698	940		2,501				6,577				
8			121,335	1,900						7,601	95		7,601		61,761
9			146,416	3,844	1,098					1,098	60,405				
10			20,060	7,389						5,911	3,694				13,300
11			260,285	6,295			141		667	6,665	370		1,852	2,222	20,737
12			22,785				1,899						6,637		9,956
13			89,660	3,334	3,334	13,291			5,835	27,506			28,339		20,004
14									3,120	3,120					9,361
15			51,427								270				
16				337	3,372				1,349	3,372		3,372	30,590		4,721
17				2,456											29,477
18				1,903						2,283			761	1,522	17,261
19								31,619		22,995			730,147		
20	949				2,068									43,952	375,274
21									1,248				5,718	5,095	56,593
22				28,948						62,032			100,044	31,705	
71	1,515			13,237	2,182					13,237	4,000			2,909	5,819
Total	15,289	0	772,587	100,635	12,994	13,291	11,069	31,639	12,256	156,646	313,487	3,372	911,691	87,440	731,925

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Station	Sea Pen	Sea Star	Other Invertebrates	Debris
1				24,255
2				3,807
3		1,269		634
4		5,942	35	12,688
5		43,235	124	
6				609,647
7				28,189
8				19,004
9		549	1,098	66,446
10				5,172
11				1,481
12		6,637		
13		3,334		3,334
14		9,361		
15				4,496
16		2,698		3,372
17			154,235	
18	1,522	381		2,283
19		66,112		17,247
20			19,649	422,184
21				5,510
22	2,757	5,514	1,516	19,398
71			18,838	
Total	4,279	145,031	195,495	1,249,147

Appendix E. Catch rates of all species or species groups caught in a bottom trawl survey of the Kamishak and Barren Islands Districts, 1998.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Dusky Rockfish	Rougheye Rockfish	Redbanded Rockfish	Redstripe Rockfish	Sablefish	Pacific Halibut	Spiny Dogfish	Skate, Unid.	Arrowtooth Flounder	Flathead Sole	Rock Sole	Dover Sole	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder
30	28.0	64.0								18.0	48.0						12.0			
32	72.0	38.0							48.0		4.0	3.4	12.6		0.5	1.5	26.4	140.6		
33	304.0	20.0							61.0	22.0	30.0	4.0	15.8	6.8	1.1	3.4	307.9	11.3		
34	6.0	108.0	0.6						102.0	42.0		161.7	10.8				366.6			64.7
37	74.0	2.0						1.0	102.0	34.0		37.5	11.2			0.6	230.1	4.8		10.7
38	0.2								47.0	24.0		78.0		10.0			272.0			18.0
41	20.0	2.0	0.3						96.0	56.0		27.3	3.6	1.2			147.7	109.4		21.9
44	14.0								174.0	48.0	14.0	155.1	16.0	9.7		2.1	610.5			116.3
45									232.0	114.0	324.0	62.9		12.6			716.6			
46										6.0		4.0					72.0		0.2	
47	42.0	88.8						0.7	22.0	66.0	42.0		43.0	18.0		0.9	6.6	154.7		6.6
48	92.0	4.0						2.1	66.5	24.0	52.0	40.0	9.0	44.0	1.1	4.9	5.7	48.0		
50	214.0			1.0					156.0	50.0	70.0	35.9	35.6			2.6	549.7		46.1	
51									122.0	12.0	22.0	373.1					1,002.6			
52									188.0	62.0	4.0	472.8					1,111.2			
53	18.0	60.0							74.0	14.0	28.0	56.0	66.0	2.9	0.4		2.2	46.0		
56	34.0							4.0	120.0	46.0	44.0	762.5	183.0		7.6	5.9				
57	158.0								28.0	6.0	120.0	2,585.6	73.9		287.3					
58	122.0	6.0							98.0	28.0	54.0	29.7	15.4				8.7	26.6		
60	28.0	2.0						14.0	64.0	18.0	68.0	136.7	2.5		52.7	62.8				
61	17.9								253.6	7.1	185.7	331.8	87.3			8.1				
67	84.0	18.0						8.0	34.0	54.0	206.0	1,375.1	102.5							
68	2.0	22.0			8.0			2.0		46.0	112.0	937.0	41.0							
Total	1,330.1	434.8	0.9	1.0	8.0	0.0	0.0	31.8	2,088.1	797.1	1,427.7	7,669.9	729.2	105.1	350.7	92.7	5,448.6	541.4	46.3	238.2
Freq.	83%	57%	9%	4%	4%	0%	0%	30%	87%	96%	78%	91%	74%	35%	30%	43%	74%	35%	9%	26%
Mean	57.8	18.9	0.0	0.0	0.3	0.0	0.0	1.4	90.8	34.7	62.1	333.5	31.7	4.6	15.2	4.0	236.9	23.5	2.0	10.4

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Station	Alaska Plaice	Sculpin, Unid.	Greenling, Unid.	Giant Wrymouth	Pacific Herring	Eulachon	Searcher/Ronquil	Sturgeon poacher	Eelpout	Other Vertebrates	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Other Crab	Weathervane Scallop	Other Scallop	Octopus	Other Bivalves	Snail, Unid.	Shrimp, Unid.
30						0.6														0.1	0.1
32		5.8				2.4		0.5				14.0	65.0	2.9	3.4	18.0	2.9			1.9	
33		27.7						1.1		2.8			6.7	3.4	1.7	4.0				1.1	0.2
34		10.7				0.1						6.0									
37								0.9				24.0	4.0			46.0				2.9	
38		2.5					0.2	0.7				8.0		0.7						2.0	
41		10.9	3.0					1.8					1.5		0.6					1.2	
44	58.1							1.6				24.0	2.0	2.1		271.9					
45								1.4				22.0		0.7						2.1	
46								0.1				22.0									
47	2.8	94.6				1.9		2.4	1.9				12.6	2.4							0.5
48	5.1	28.0	1.0			0.9	1.1	2.4					6.0	0.2						0.4	
50													2.0			4.0					
51													12.0	5.1		6.0				3.9	
52																4.0					
53	32.0	9.7	0.8			0.9		0.3	0.1	0.3			35.0	4.7						2.4	0.1
56		0.2								1.7			0.2	2.0		0.6				4.5	
57													2.0	2.8							
58	46.1	18.9				1.0							16.0	7.7						5.6	0.5
60							4.5						1.0	6.3			3.8			2.5	1.3
61									1.9				0.2	1.9						5.8	
67		11.2											10.5	9.8							8.4
68									4.5				44.5	0.8							3.0
Total	144.1	220.2	4.8	0.0	0.0	7.8	5.8	13.2	8.4	4.8	0.0	120.0	221.2	53.5	5.7	354.4	6.7	0.0	0.0	36.6	14.1
Freq.	22%	48%	13%	0%	0%	30%	13%	48%	17%	13%	0%	30%	74%	70%	13%	35%	9%	0%	0%	61%	35%
Mean	6.3	9.6	0.2	0.0	0.0	0.3	0.3	0.6	0.4	0.2	0.0	5.2	9.6	2.3	0.2	15.4	0.3	0.0	0.0	1.6	0.6

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Station	Red Sea Urchin	Green Sea Urchin	Sea Cucumber	Anenome	Sea Pen	Sea Star	Other Invertebrates	Debris
30		0.2					1.8	0.1
32					1.0	26.4		59.0
33					0.6	11.3		1.9
34					4.8			
37					1.4			2.9
38				10.8	0.4			0.1
41						3.0	0.3	0.3
44								0.5
45				4.2		1.5		4.2
46								0.5
47					1.9	25.6	0.9	5.2
48		2.3		0.7	1.5	0.2	3.0	0.4
50				13.2				4.0
51								1.3
52								
53		1.1		0.1	0.1	0.7	6.4	2.6
56		28.6				3.4		
57		93.2				6.3	28.9	
58					5.3	5.1		15.4
60		42.7				7.5		5.3
61		28.9						1.9
67		58.9						3.5
68		2.3				6.9		2.0
Total	0.0	258.2	0.0	28.9	16.8	98.0	41.3	111.1
Freq.	0%	39%	0%	22%	39%	52%	26%	83%
Mean	0.0	11.2	0.0	1.3	0.7	4.3	1.8	4.8

Appendix F. Population biomass estimates in surveyed stations for species caught in a bottom trawl survey of the Kamishak and Barren Islands Districts, 1998.

Station	Pacific Cod	Walleye Pollock	Pacific Tomcod	Dusky Rockfish	Rougheye Rockfish	Redbanded Rockfish	Redstripe Rockfish	Pacific Halibut	Sablefish	Spiny Dogfish	Skate, Unid.	Arrowtooth Flounder	Flathead Sole	Rock Sole	Dover Sole
30	111,094	253,928								71,417	190,446				
32	285,669	150,770						190,446			15,871	13,447	49,945		1,921
33	1,206,159	79,353						242,025		87,288	119,029	15,713	62,852	26,936	4,489
34	23,806	428,504	2,358					404,698		166,640		641,730	42,782		
37	293,604	7,935						404,698	3,968	134,899		148,632	44,470		
38	794							186,479		95,223		309,475		39,676	
41	51,160	5,116	771					245,568		143,248		69,943	9,252	3,084	
44	55,547							690,367		190,446	55,547	615,184	63,573	38,449	
45								920,490		452,310	1,285,511	249,395		49,879	
46										23,806		15,871			
47	153,434	324,321						80,370	2,411	241,111	153,434		157,036	65,778	
48	360,270	15,664						260,413	8,202	93,984	203,631	156,639	35,396	172,303	4,317
50	849,072			3,968				618,950		198,381	277,734	142,244	141,116		
51								484,051		47,612	87,288	1,480,228			
52								745,914		245,993	15,871	1,876,037			
53	71,417	238,058						293,604		55,547	111,094	222,187	261,863	11,371	1,749
56	134,899							476,115	15,871	182,511	174,576	3,025,123	726,030		30,011
57	626,885							111,094		23,806	476,115	10,258,612	293,172		1,139,846
58	419,004	20,607						336,577		96,165	185,461	101,956	52,736		
60	111,094	7,935						253,928	55,547	71,417	269,799	542,237	9,962		209,198
61	70,851							1,006,077		28,340	736,845	1,316,610	346,476		
67	333,281	71,417						134,899	31,741	214,252	817,331	5,455,942	406,508		
68	7,935	87,288			31,741				7,935	182,511	444,374	3,717,715	162,820		
Total	5,165,975	1,690,896	3,129	3,968	31,741	0	0	8,086,763	125,674	3,046,906	5,619,956	30,374,919	2,865,988	407,477	1,391,531

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Station	Rex Sole	Butter Sole	Yellowfin Sole	English Sole	Starry Flounder	Alaska Plaice	Sculpin, Unid.	Greenling, Unid.	Giant Wrymouth	Pacific Herring	Eulachon	Searcher/Ronquil	Sturgeon poacher	Eelpout	Other Vertebrates
30		47,612									2,187				
32	5,763	104,561	557,657				23,051				9,605		1,921		
33	13,468	1,221,827	44,894				109,990				11,223		4,489		
34		1,454,589			256,692		42,443				472				
37	2,341	913,025	18,958		42,466								3,511		
38		1,079,195			71,417		10,038					794	2,793		
41		377,690	279,770		55,954		27,755	7,710					4,626		
44	8,476	2,422,287			461,388	230,694							6,357		
45		2,843,103											5,498		
46		285,669		794									397		
47	3,462	24,234	565,329		24,234	10,386	345,479				6,924		8,655	6,924	
48	18,993	22,446	187,967			19,856	109,647	3,885			3,453	4,317	9,496		
50	10,453	2,181,075		182,928											
51		3,978,113													
52		4,408,686													
53		8,747	182,511			126,964	38,487	3,061			3,499		1,312	350	1,312
56	23,342						667								6,669
57															
58		29,884	91,409			158,208	65,041				3,516				
60	249,045											17,931			
61	32,081													7,638	
67							44,549								
68														17,948	
Total	367,425	21,402,741	1,928,495	183,722	912,152	546,109	817,148	14,656	0	0	40,878	23,041	49,056	32,860	7,981

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Station	Dungeness Crab	Red King Crab	Tanner Crab	Hermit Crab	Other Crab	Octopus	Weathervane Scallop	Other Scallop	Other Bivalves	Snail, Unid.	Shrimp, Unid.	Red Sea Urchin	Green Sea Urchin	Sea Cucumber	Anenome
30										437	437		873		
32		55,547	257,896	11,526	13,447		71,417	11,526		7,684					
33			26,517	13,468	6,734		15,871			4,489	898				
34		23,806													
37		95,223	15,871				182,511			11,703					
38		31,741		2,619						7,856					42,771
41			3,939		1,542					3,084					
44		95,223	7,935	8,476			1,078,725								
45		87,288		2,749						8,247					16,494
46		87,288													
47			45,848	8,655							1,731				
48			23,496	863						1,727			9,065		2,590
50			7,935				15,871								52,265
51			47,612	20,396			23,806			15,297					
52							15,871								
53			138,867	18,806						9,622	437		4,374		437
56			875	8,003			2,187			18,007			113,376		
57			7,935	11,168									369,955		
58			54,951	26,368						19,337	1,758				
60			3,968	24,905				14,943		9,962	4,981		169,351		
61			709	7,638						22,915			114,576		
67			41,660	38,980							33,412		233,881		
68			176,559	2,991							11,965		8,974		
Total	0	476,115	862,572	207,612	21,723	0	1,406,257	26,468	0	140,366	55,619	0	1,024,424	0	114,558

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Station	Sea Pen	Sea Star	Other Invertebrates	Debris
30			7,173	437
32	3,842	104,561		234,125
33	2,245	44,894		7,632
34	18,863			
37	5,383			11,703
38	1,397			397
41		7,710	771	771
44				2,119
45		6,048		16,494
46				1,984
47	6,924	93,474	3,462	19,041
48	6,043	863	11,655	1,727
50				15,680
51				5,099
52				
53	262	2,624	25,366	10,496
56		13,338		
57		25,129	114,477	
58	18,282	17,579		52,736
60		29,885		20,920
61				7,638
67				13,921
68		27,520		7,777
Total	63,241	373,625	162,903	430,698

Appendix G. Bottom temperature recordings during Cook Inlet trawl surveys, 1992-1998.

Southern District			
Date	Station	Depth (fm)	Temp (°C)
7/15/92	4	32	7.5
7/16/92	7	37	7.5
7/17/92	10	47	7.8
7/18/92	11	55	7.9
		Average =	7.7
7/6/93	5	16	6.9
7/7/93	7	34	6.7
7/8/93	8	67	6.6
7/12/93	7	39	7.1
7/13/93	18	36	8.4
7/14/93	15	41	7.6
		Average =	7.2
6/27/94	3	30	6.3
6/28/94	5	22	6.4
6/29/94	8	81	6.0
6/30/94	11	54	6.5
7/5/94	13	57	6.5
7/6/94	18	35	7.4
		Average =	6.5
7/5/95	5	16	6.3
7/6/95	2	28	5.7
7/7/95	10	49	6.4
7/8/95	71	66	6.3
7/9/95	8	92	6.0
7/10/95	15	39	7.4
		Average =	6.4
8/19/96	10	46	9.2
8/20/96	18	35	9.7
		Average =	9.5
6/27/97	10	49	6.6
		Average =	6.6
8/14/98	9	65.6	9.3
8/17/98	5	16.5	9.6
		Average =	9.5

Kamishak and Barren Islands Districts			
Date	Station	Depth (fm)	Temp (°C)
7/10/92	61	82	6.7
7/11/92	67	90	6.3
7/12/92	53	24	9.3
		Average =	7.4
6/28/93	53	22	8.2
6/29/93	31	12	10.2
6/30/93	67	92	5.5
7/1/93	54	23	8.8
7/2/93	44	26	8.0
		Average =	8.1
6/14/94	67	89	5.9
6/15/94	38	29	6.8
6/16/94	47	18	7.4
6/17/94	51	55	7.1
		Average =	6.8
6/19/95	34	27	7.9
6/20/95	44	30	7.4
6/21/95	67	94	7.1
6/22/95	47	19	5.9
6/23/95	41	16	7.2
6/24/95	23	16	7.1
		Average =	7.1
6/20/96	68	91	5.5
6/21/96	58	23	7.6
6/22/96	41	17	8.3
6/23/96	37	27	7.6
		Average =	7.3
6/8/97	61	84	ND
6/9/97	68	89	ND
6/12/97	37	27	ND
6/16/98	61	81.0	5.7
6/17/98	60	75.5	6.8
6/28/98	33	21.0	9.0
6/29/98	44	29.0	8.1
6/30/98	41	16.5	9.5
		Average =	7.8